AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

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Iron Planing and Shaping Machines.

The left hand illustration on this page represents a Planing Machine of elegant design to plane 17 inches square, and 42 inches long, made by Messrs. Ferris & Miles, of Philadelphia. It is specially designed for doing small work with great quickness and facility; is very compact; takes up but little room in a shop, and combines, in a marked degree, the most recent and valuable improvements in the construction of planing machines.

It has, for instance, been made with its bed cast upon a sustaining pedestal of neat appearance, which, while affording it a rigid support, also effectually prevents the machinery from ever being out of line, no matter in what position it may be placed.

The driving gear is so arranged that the machine may be located parallel with the line shafting from which it is driven.

The quick return of the table, and also the slow forward motion for cutting are effected by vertical belts from pulleys of different diameters upon the countershaft, without the double train of gearing formerly used for that purpose. The device for shifting these belts has also been separated from that feeding the cutting tool, and important advantages have resulted therefrom, which greatly enhance the effectiveness of the machine. For example: While the countershaft and belts are running at full speed, the table may, without stopping them, be itself instantly stopped or started by the easy movement of a suitable handle; its speed reduced and its traverse reversed and controlled within the fraction of an inch.

The feeding device is positive and self-acting in all directions: horizontal, vertical and angular; has no pawls, detents or frictions, and will take wide finishing cuts automatically. It uses no power except at the moment of feeding, dispensing entirely with the usual friction disc, which consumes about one-third of the power of the machine, and will not *pull* a wide feed. This is the only very small planing machine which has automatic angular and vertical feed motions.

Both the belt shifter and feed motions can be instantly thrown out of gear whenever desired. The table can then be run to the limit of its traverse, backward or forward, without operating by its motion or by its *reversing* either the shifter or feed gear. This is a great convenience in setting or examining work, and also in making a temporary adjustment of the stroke by hand, to reach, without moving the dogs, places outside the limits fixed by their position.

The table can be furnished, if ordered with a simple device, at slight expense, by which work can be promptly and securely placed and held for planing, without the ordinary cumbrous and expensive chuck.

The right hand illustration on this page represents a

SHAPING MACHINE WITH FIXED HEAD.

These machines are very compact and handy, easy of access from every side, and are adapted to a great variety of work.

The illustration represents a machine of this class by Messrs. Ferris & Miles, of Philadelphia, of a very pleasing and novel design. It can plane with 10-inches stroke over a traverse of 18 inches in width.

The frame, which consists of a round taper column with a circular base, has cast upon it the cross slide for the table, and also the bracket for the driving gear.

The cutter bar is driven in the most approved manner by a variable crank fitted with the "WHITWORTH QUICK RETURN" motion. It is strongly geared from large cones for wide belts, and can take very heavy cuts.

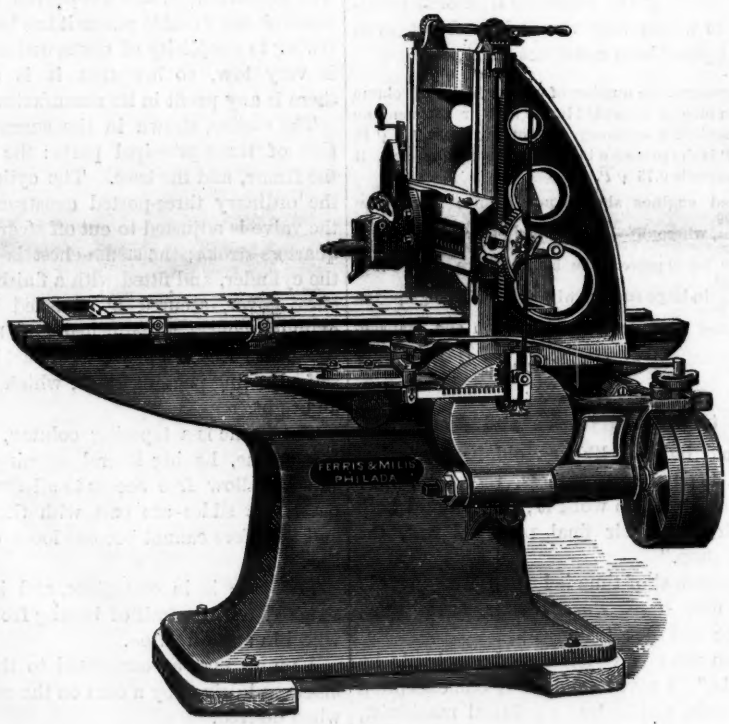
The device for feeding the table is positive by a double pitched screw, either by hand or by the automatic feed gear. If desired, it can be fitted at slight expense, with a special device for promptly and securely setting and holding work for planing, which dispenses in nearly all cases with the usual cumbrous and expensive vise or chuck.

If preferred, however, a strong and accurate clamping vise, and also a pair of convenient centres can be furnished with the machine.

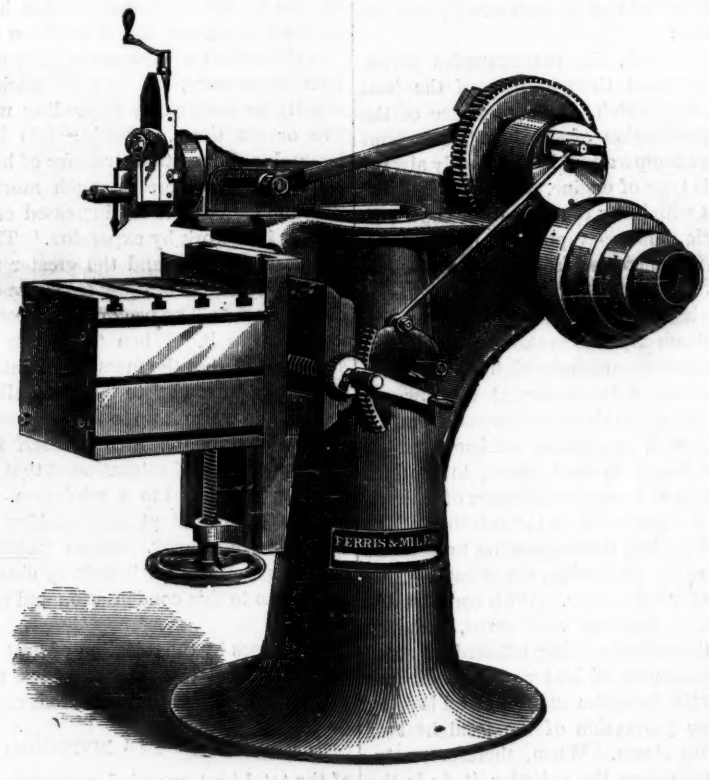
A rotary arbor, with cones for circular work, can be attached if desired. It is instantly adjustable for action upon removing the table.

The whole machine is characterized by simplicity, strength and convenience.

These Planers and Shapers are manufactured by Ferris & Miles, Philadelphia, who are represented by the Bullard Machine Co. (Limited), 14 Dey Street, New York, where the machines can be seen at any time.



PLANER.



SHAPER.

Comm'r-General McCormick has received nearly 800 applications to exhibit at Paris.

On a new type of Steam Engine, theoretically capable of utilizing the full mechanical equivalent of Heat-Energy, and on some points in theory indicating its practicability.

Presented at the Nashville meeting of the American Association for the Advancement of Science, 1877.

(ABSTRACT.)

BY PROF. ROBERT H. THURSTON, OF THE STEVENS INSTITUTE OF TECHNOLOGY, VICE PRESIDENT.

It is easy to show that the existing common type of steam engine, even if perfect as a piece of mechanism, necessarily wastes a very large proportion of the heat-energy which is supplied to it, and that no possible improvement short of a complete change of type can greatly increase the efficiency of the best modern engine.

A steam engine, theoretically capable of fully utilizing the heat-energy supplied, and of delivering the mechanical equivalent of that heat, has never yet been constructed. The possibility of constructing such an engine has been denied by both physicists and engineers. Nevertheless, theoretically perfect air and gas engines have been designed and built, and a steam engine can probably be made, which may fully utilize all heat not lost by conduction, radiation, and friction. The object of the present paper is to show, not only the possibility of designing such an engine, using steam as the working fluid, but also the probable practicability of constructing a machine which shall waste no heat, except by conduction and radiation, and no power except by friction, under conditions which the engineer will admit to be attainable.

The theory of the proposed new type of

engine is perfectly simple; and its construction, although involving the overcoming of grave difficulties in the reduction of losses by friction to a satisfactory extent, may possibly prove no more difficult a problem than have been many others already solved.

The working fluid is assumed to be steam, because the proposed type of engine cannot be adapted for use with the permanent gases without special and undesirable modifications

The average performance of the best engines built to-day, to work through the assumed range of temperature and pressure, does not even approximate to the calculated efficiency of the perfect engine. The latest and best type of compound engine, taking steam from the boiler at seventy-five pounds pressure by gauge, and exhausting its steam at a temperature approximating that assumed in the usual calculations, requires, usually, about twenty pounds of steam, or, say, two pounds of coal per hour and per horse-power. Good engines as now built, therefore, waste at least one-half the heat which is theoretically *available* for the production of power in the existing type of steam engine.

The sources of loss are, then:

1. Friction.
2. Conduction and radiation of heat.
3. The rejection of unutilized heat in the exhaust steam.

The first two of these methods of loss are comparatively unimportant, and by proper management, can be reduced to a very insignificant amount. It is the last named cause of loss of work that is to be studied, with a view to the determination of some method of greatly increasing the efficiency of the steam engine.

The rejected heat which is exhausted from the engine at the end of each stroke, consists of two parts:

1. That which, in the examples given, constitutes about three-fourths of the heat supplied, and which, in consequence of the natural distribution of the heat throughout the scale of temperature, is necessarily always lost in this type of engine.

2. That which, by the operation known as condensation and re-evaporation in the steam cylinder, is transferred from the steam chest to the exhaust side, at each stroke, without doing its share of the work of the engine.

When steam expands in the steam cylinder, it enters at a comparatively high temperature, and at the end of the stroke, at the lowered pressure, has a considerably decreased temperature. There is therefore a tendency, which sometimes has a marked effect, to produce similar changes in the temperature of the cylinder itself—heating it at the entrance of the steam, and cooling it as expansion progresses. The greater the expansion, the greater is this variation of temperature. With considerable expansion, it becomes very great, and the metal of the cylinder being affected to some depth, the amount of heat passing back and forth between the steam and the metal is often a very large proportion of the total heat of the entering steam. When, therefore, saturated steam enters the cylinder, it finds the interior surface of the metal comparatively cool, its temperature having been reduced by contact with the exhaust steam just rejected from it. Condensation, therefore, occurs and continues until a sufficient amount of heat has been transferred from the entering steam to the metal of the cylinder, to restore it to the temperature of the prime steam. Thus it is invariably the fact, when superheating is not practiced, that the steam cylinder, at the instant of closing the steam valve, contains both steam and water. The relative amount of the two fluids varies greatly, but it is usually found, where considerable expansion is adopted, that the weight of water is quite great. After the closing of the induction valve, and as expansion progresses, the water, originally at the temperature of its boiling point, under boiler pressure and that of the entering steam, finds itself under a constantly decreasing pressure. Re-evaporation, commencing with the first decrement of pressure, goes on regularly, until the expansion is brought to an end by the termination of the stroke of piston and the opening of the exhaust valve. During this re-evaporation, the water can only obtain its latent heat of evaporation by robbing the surrounding metallic surfaces, after absorbing from the supernatant steam any slight excess of temperature above that due its pressure, which the latter may have itself taken from the metal of the cylinder during that period of rapidly decreasing temperature and pressure which immediately succeeded the commencement of the expansion. Finally, at the opening of the exhaust valve, a sudden drop of pressure occurs, and the whole mass of mingled steam and water remaining in the cylinder at once expands into the condenser, or into the atmosphere, and the re-evaporation of water, which now occurs in great quantity, makes another draft upon the cylinder, reducing its interior to, approximately, the temperature of the condenser or of the boiling point, under atmospheric pressure. Thus heat is taken into the metal of the cylinder from the "live" steam at the beginning of the stroke, and transferred to the exhaust steam, and thrown away without conversion into work. The heat absorbed in re-evaporation before the exhaust takes place, is partly utilized; but that which is taken up at the opening of the exhaust valve, is wholly wasted.

The process of waste just described is one of the most serious causes of loss of heat in the modern steam engine; in some cases, the loss from this cause exceeds that due to the unavoidable rejection of heat at the lower limit of temperature, which only is taken into account in all accepted theoretical estimates of efficiency. It is this method of waste that prevents the engineer acquiring even an approximation to the estimated gain due to considerable expansion. It is this which places a limit to our expansion of steam, which limit has, as yet, been but little altered by any of the expedients which have been adopted to extend it. It has been found by experience that with steam of sixty or seventy pounds pressure, no gain in efficiency can usually be secured by expanding more than five or six times. Passing this limit, the losses due the wasteful transfer of heat to the exhaust steam increase much more rapidly than the gain due to the increased conversion of heat into work by expansion.[1] The higher the steam pressure and the greater the speed of piston, the less the loss from the operation of this cause. The use of superheated steam also reduces it. When the steam is so far superheated that the mass taken into the cylinder may surrender to the metal all the heat required to warm it up to the temperature due the steam pressure, without itself falling to the temperature of saturation at that pressure, this loss is reduced to a minimum. But the saving is effected at the sacrifice of some theoretical efficiency. Steam jacketing produces its well known benefit by checking the waste due to this condensation and re-evaporation.

The losses by the rejection of heat from the engine without transformation are thus seen to be due to two entirely different causes; the first, which is always a proportion, $\frac{Q'}{Q} \times U$, of the total heat supplied, can evidently only be saved by some radical change of type of engine. The second, which has been diminished, but has never been wholly checked by known expedients, seems very probably to require equally radical treatment to effect its cure. It is perfectly evident, nevertheless, that to secure any great increase in the efficiency of heat engines in which steam is to be used as the working fluid, some change must be made by which these losses must be avoided; it is only then by a change of type that the now usual loss of nearly three-fourths the heat by rejection at the lower limit of temperature, and of a very large fraction of the remaining energy, can be, to any considerable extent, prevented. Could a change of type be secured by which all this heat could be utilized, giving a theoretical efficiency of unity, we might expect an actual efficiency of at least one-half, and thus obtain a horse-power by the expenditure of five pounds of steam, and the combustion of a half pound of coal per hour. The best existing type of engine has been seen to demand four times this amount, and it is very common for engines to require ten times as much.[2]

It now remains to be determined whether there is any way by which these losses of rejected heat can be avoided.

There are two forms of engines of class 1st, in which—were it possible to fully avail ourselves of them—all this waste of energy may be avoided.

Type A. The working fluid, if expanded from the temperature and pressure of the boiler or reservoir quite down to the absolute zero, would have all its heat-energy transformed into mechanical work, and there would be no waste. The efficiency would be perfect.

Type B. All heat rejected from the cylinder unutilized may be gathered up and restored to the boiler, there to serve as a basis upon which to pile a new stock of transformable heat-energy, instead of being, as now, rejected from the system entirely and lost. This done, there could be no loss, as all heat leaving the machine would be transmitted to exterior bodies as mechanical energy. Nothing being lost as heat, the efficiency of the engine would be unity and its economy a maximum.

Forms of steam engines may be conceived in which these methods (of saving heat now wasted) may be applied. Practically, however, it is evident, the first form of these two ideal engines can never be made successfully, since it would require to be made of such immense size that all the power derivable from it would be insufficient to move the engine itself. The great expansion of steam necessary to secure the reduction of the mass to the liquid state, even—to say nothing of the probable impossibility of making heat contained in the water available—would compel the adoption of cylinders of such great volume as would prevent the adoption of such engines. All advantage theoretically derivable from their use would be more than neutralized by the immense frictional resistances to which they would be subject, even were it possible to construct them.

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[1] In general, the number of times which the volume of steam may be expanded in the high-pressure engine with maximum economy, is not far from $\frac{1}{4}\sqrt{P}$, where P is the pressure in pounds per square inch, it rarely exceeds $0.75\sqrt{P}$.

[2] Good engines should not require more than $W = \frac{200}{\sqrt{P}}$, where W = the weight of steam per hour and per horse power; the best practice gives about $W = \frac{150}{\sqrt{P}}$ in large engines with dry steam, high piston speed, and good design, construction and management.

To be continued.

Hints to Manufacturers and Mechanics.

An old lathe is like an old horse, it has passed its days of usefulness, therefore, time is lost on trying to work it; they should both be retired to their final place of rest, the "junk shop."

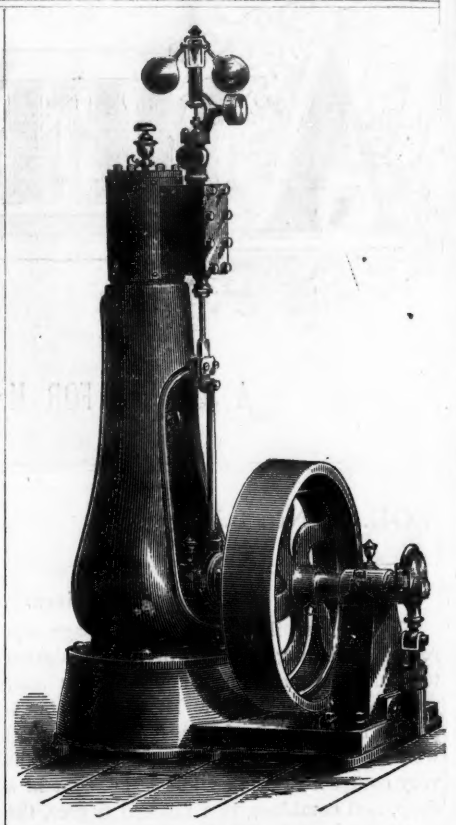
A great deal of time is lost in working old scrap; new stock works better, saves time, patience and money.

"You can always tell a good mechanic by his tools." I never found but one exception to this rule, and he was a political machinist, who had worked long enough in "the Navy Yard" to *make* a kit of tools for himself. He was dressed in a suit of custom made clothes, and in his right hand he held a black walnut tool box, 2 feet long × 1 foot wide × 1 foot deep. Like his tool chest and tools, he was of good appearance and high polish; and strange to say, he was like them in many other respects. His head, like the heads of his hammers, had been but little tried, and when put to the test, was found *soft*, like his try square, he was untruthful and unreliable. Like his tools, as a whole, he was bad tempered, and of poor stock. He spoiled his first job, then silently stole himself and tools away.

Moral.—Never make yourself a set of tools in your employer's time; they will be living lies, never square, truthful or reliable, no matter how high a polish you may give them.

F. H.

The great 50-ton, 12-inch gun, cast at South Boston last spring, has been finished, and will be transported to New Jersey soon. The cost of making another such gun would be about $40,000, but in this case it was greater, as some of the machinery used had to be cast and forged for this particular purpose.



The Twiss Vertical Engine.

Small power engines seem to meet with an increasing demand, especially those of the vertical type. Within the past few years numerous styles of engines have been placed upon the market, and the aim seems to have been to make them cheaper and cheaper, until a large proportion of them now before the public are neither durable nor economical. The engine shown herewith is well made, well proportioned, and has proved itself economical and durable where it has been in use. Owing to simplicity of contsruction the price is very low, so low that it is a wonder there is any profit in its manufacture.

The engine, shown in the engraving, consists of three principal parts: the cylinder, the frame, and the base. The cylinder is of the ordinary three-posted construction, and the valve is adjusted to cut off steam at three-quarters stroke; the steam-chest is cast upon the cylinder, and fitted with a finished steam-chest cover, secured by finished bolts; the cylinder covers are finished and secured in like manner. The piston is of cast iron, with self-adjusting packing rings, which work free and tight.

The frame is a tapering column, of graceful outline, having liberal openings in the sides to allow free access to all the working parts; the slides are cast with the column, and therefore cannot become loose or out of line.

The base is in one piece, and is so constructed as to admit of belting from the fly-wheel in any direction.

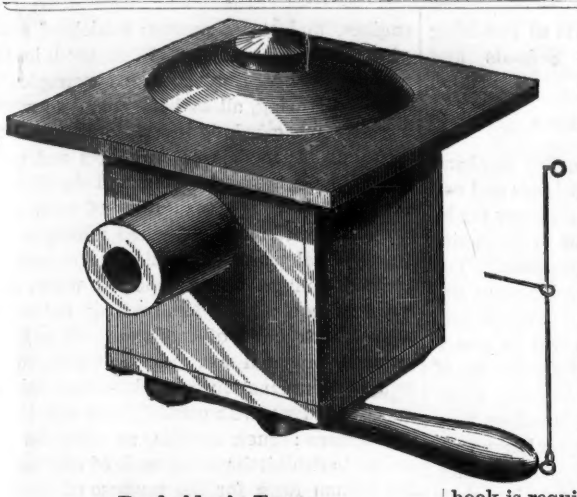
A pump may be connected to the pillow-block and driven by a cam on the main shaft when desired.

This engine is manufactured by Nelson W. Twiss, New Haven, Conn. It was awarded a medal at the Centennial, also a medal of progress at the last American Institute Fair.

The Useful Companion and Artificer's Assistant.

An illustrated volume of 700 pages, issued by the Empire State Publishing Co., New York, is a plain, practical work for every-day use in the shop, and will be found valuable alike to apprentices and skilled workmen. It avoids algebraic formulas and mathematical problems, while giving in available form such information as machinists, engineers and other artisans should acquire. The book has already had a very large sale, and it deserves a still larger sale. The price is low enough to bring it within reach of almost any mechanic.

E. J. Worcester, of Worcester, is preparing to offer to the trade this coming season, his new lawn mower grinding machine. It runs by foot power, and will sharpen the cutters accurately and quickly without the aid of a skilled workman.



Burbridge's Tweer.

Much inventive skill has been directed to regulating forge fires by means of tweers, and the devices for this purpose are very numerous. The one shown herewith is the invention of a blacksmith, of over forty years' experience, and is simpler than most others in use, and at the same time efficient and reliable. The essential feature is an adjustable spindle, around the head of which the wind is delivered, giving a globular blast, and causing a round or elliptical fire. In most tweers the wind is forced in one or more straight lines up through the fire, and a large amount of coal must be used to keep it confined, and spread out over sufficient surface to heat a piece of iron steadily and evenly on every side. With Burbridge's tweer the wind rolls out from the centre on every side, in a curve, and comes together in one volume at the top of the fire, forming a hollow globe, inside of which the object is placed to heat. As the fire, or, rather, the blast, completely envelopes the object, it is evident that it will heat as evenly and steadily as if placed in a furnace. The valve (or spindle head) is so shaped that no melted iron or clinkers can enter the wind cavity to obstruct it, but pass off over the inclines out of the way of the fire. It does not require as large a fire to do the same work as the tweers in common use, burns the coal very clean, and therefore economizes fuel, as well as making it less disagreeable for the blacksmith to stand over the fire. By setting the lever higher or lower, the amount of wind may be regulated so as to heat fast or slow. It is best to have a strong and steady blast, with as small a volume of wind as will be required. The lever can be used to stir up the fire instead of a poker. This saves breaking it up. It will heat from a 150 pound object down to the horse nail. The advantages of a non-clogging, quick-heating tweer will be appreciated by all those having machine blacksmithing to do, especially where large and careful heats are to be made.

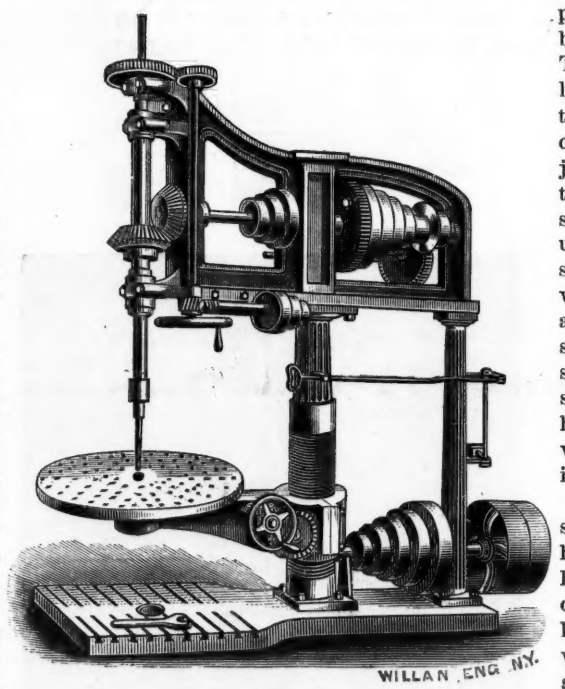
Burbridge's tweer has been used several months in some of the largest machine shops in Connecticut, where we have heard many experienced blacksmiths speak of it in the highest terms. White & Burbridge, Middletown, Conn., are the manufacturers. It is also sold by H. Prentiss & Co., 14 Dey Street, New York.

Double Column Drill.

We give herewith a description of a double column drilling machine, designed and manufactured by the Freeland Tool Works of New York City. This machine was designed to meet the objections urged against the single column drill, viz., a want of stiffness in the column sufficient to withstand the pressure against a heavy cut; they were also intended to take the place of an ordinary column supporting the floor above, a short column being placed on top of the machine. By this arrangement much valuable room is utilized which would otherwise be wasted. "They are built," say the manufacturers, "in the most substantial and thorough manner, and although being very heavy, the metal is placed just where it will do the most good." The base plate is heavily ribbed on the bottom to insure the proper stiffness, and if planed on top it has a series of T grooves for bolts, and also a hole bored through it in line with the spindle, as a bearing or guide for boring bars; this base is six feet long and three feet wide, tapering off gradually towards the end supporting the small column.

The two columns are bolted to the base-plate in a substantial manner, and also to the frame on top; the large column, which is 8½ inches in diameter, has a series of rings cut in it which serves as a rack for elevating the bracket carrying the table, the gearing attached to the bracket for raising or lowering it is so arranged that the operator can raise as much weight as is generally put on the table, with the greatest ease, and no catch or hook is required to hold it. The table is 30 inches in diameter, and is fitted to a spring bearing on the end of the bracket, in which it can turn, and the bracket is free to turn on the column so that the table may be swung entirely clear of the base; the center of the table is also bored out in line with the spindle for an additional support for boring bars; distance from center of table to column 24 inches, distance between bed-plate and end of spindle 50 inches.

The spindle, which is of steel, is 2½ inches diameter, and has an endwise motion only in the driving sleeve, thus reducing its wear to a minimum; this sleeve, which is of cast-iron, 3¼ inches beam, carries the bevel wheel, by which motion is communicated from the shaft, it runs in substantial bell-metal bearings—one on each end; this arrangement adds materially to the stiffness of the spindle, and the capabilities of the machine for boring true holes. The feed arrangement is positive (no friction being used), and has six changes, three by the small cone pulleys, and three more by changing the two gears on the top. The large cone pulleys have five speeds, 2½ inches face, and the counter-shaft is so arranged between the two columns that quite along belt may be used; the tight and loose pulleys on the counter-shaft are 15 inches diameter and 3 inches face; there is also a very substantial back-gear attached which increases the capacity of the machine to a great extent, it being capable of boring cylinders 14 inches diameter by 20 inches long; the speeds of the spindle varies from 4 revolutions per minute to 300.



DOUBLE COLUMN DRILL.

The weight of this machine is 3,300 lbs.

The Freeland Tool Works, who manufacture this drill are located at 558 and 560 West 34th Street, New York.

Machinery Accidents.

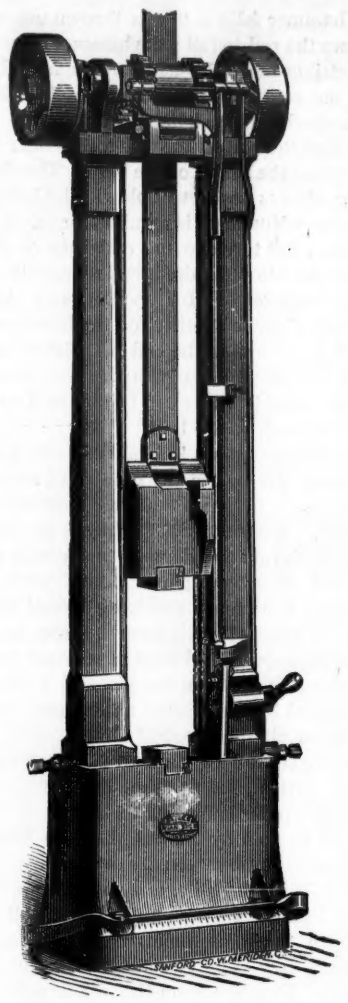
The *Miller* directs attention to the fact that experience, unhappily for mankind, does not always tend to make men wise. Indeed, in some cases it appears to have an actually opposite effect. How else can we account for the sad and sickening, almost tautological repetition of accidents, resulting solely through the careless use of machinery, year after year, although the fullest light of experience has been thrown in each case on those who have owed their death, perhaps to nothing but their own astounding folly and gross carelessness beyond all belief? In the case of accidents connected with the manipulation of machinery this is the more strange, as the worst and most deadly disasters generally befall those who are most intimately acquainted with the nature of the mechanism in whose midst they are probably moving daily.

Let us particularize. We believe a good many casualties are due to the careless handling of belts, and especially the throwing them on or off pulleys in motion. There is, of course, a right and a wrong way to put on a belt. One speaking from practical experience says: The belt should be first placed on the pulley at rest, and then run on to the one in motion. In some cases where the belt is heavy, or the shaft runs very swiftly, it is best to slacken the speed, so that the shaft barely moves. Where this is impracticable great care should be observed in mounting the belt on the pulley face. The operator should have a firm and solid foothold, and see that no part of his person or clothing gets between the belt and pulley. Then again belts from running overhead shafts are frequently run on or off by means of a long stick, the operator standing on the floor. In throwing a belt off the danger of accident is not great, but in running a belt on in this manner the stick is liable to be caught and thrown with great violence, at the hazard of breaking human heads or valuable machines. Such a practice as this is very dangerous. Sometimes a very careless operative will stand on the floor and just cast the belt on the face of the revolving overhead pulley. Once on, it must be held motionless in its place with one hand, against the friction of the pulley face, while the other hand guides it on the loose pulley of the machine, or the tight pulley, if there be no loose one. The danger surely is obvious—the belt may catch in a projecting key, or the head of a set screw, or double under on the shaft, when it will wind up with a velocity corresponding to the speed of the shaft, and perhaps carry the workman with it.

Besides these special perils, we have the reprehensive practice of using fast and loose pulleys without a belt guide, which too often leads to deplorable accidents. A noteworthy instance has been recently recorded in a contemporary. A man was adjusting a pair of steam-power shears, and by some means, and all unexpectedly to him, the belt on the loose pulley worked over on the stationary pulley, and set the shears in motion. His left arm at the time was between the blades, which, closing with great force, nearly severed the arm near the wrist, cutting through the flesh and bones, and leaving the hand hanging by a few tendons and the skin. The arm was amputated near the elbow.

We believe that the extension of automatic agencies would save many from the loss of life or limb, but at the same time it must not be overlooked that the vast majority of accidents of all kinds occurring in the necessary manipulations of machinery, are chiefly traceable to the gross carelessness of those who know so well the irresistible power of the agencies under their control, and yet every now and then act with an amount of folly that would be reprehensible in any mere business transaction, where, however, human life was not at stake.—*Leffel's News.*

The number of new articles in the machinery line that are soon to be placed upon the market is large..

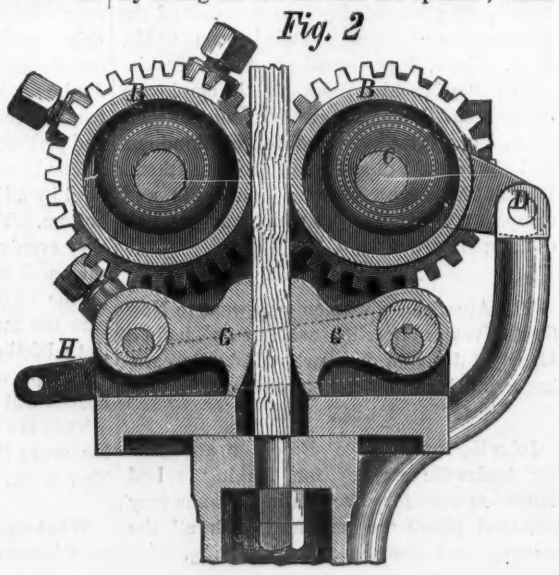


Hotchkiss & Stiles' Drop Press.

The large and increasing use of drop forgings gives rise to many inventions to produce them rapidly and efficiently. We present, herewith, an illustration of Bennett Hotchkiss & N. C. Stiles' Patent Drop Press, which presents specially valuable features. It is of that class in which the hammer is raised by a stiff belt or board passing up between the two friction rolls. The principal improvement in this drop is in the arrangement for holding up the hammer. By it any height of blow can be obtained automatically by one adjustment. In order to describe the arrangement more fully, it may be well to refer to other hammers of similar construction. The hammer is held up with a dog that passes under it on one side as the hammer ascends, this dog being changed by pin holes located in the upright, eight or ten inches apart, so the height can only be changed to within the distance apart the holes are located, and they cannot be very near together, as it would weaken the upright. The dog to hold up the hammer is objectionable; operating on one side causes the hammer to tip and give a blow on the opposite upright, sometimes causing it to break.

In this drop two friction rolls are employed, running in opposite directions. Passing up between the same is a board, the lower end of which is secured to a hammer by an elastic connection which prevents the sudden jar and destruction of the same. The rolls are made to press against the board by the weight on the upright rod, the same being sufficient. By lifting the rod the rolls are opened; when

Fig. 2

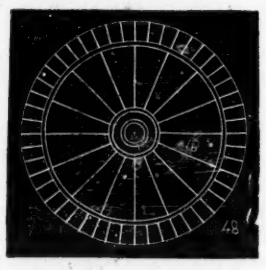


the hammer falls a trip is thrown out which allows the rod to fall ; the hammer on ascending strikes the collar at the upright rod, lifting the same and opening the rolls. It will be noticed that the hammer will ascend until it strikes the collar, and when the collar is set determine the height of the blow. The clamps being always ready to hold up the hammer, no other adjustment is required for any height of blow, but to move the collar up or down to suit the blow required. Besides this automatic arrangement for opening and closing the rolls, there is another rod the lower end of which is secured to the end of a lever which can be operated either with the foot or hand, so that variable blows can be obtained on one piece of work at one heat.

The automatic trip is a valuable attachment to a drop. By its use any number of repeated blows can be obtained with one movement of the foot. Without this attachment the operator must elevate and depress the treadle with the foot at every blow. Any workman operating a hammer requiring several blows upon one piece of work from the same height will appreciate this advantage. Several blows of different heights on one piece of work can be obtained by the treadle attachment which is also on all these patent drops. Our cut shows a SECTION OF LIFTER IN THE HOTCHKISS & STILES DROPS, showing the clamps that hold up the hammer.

It will be seen by the cut that the belt or board passes up between the two clamps G, G, situated under the rolls, and so arranged that as the hammer ascends the clamps will lift and open freely of themselves, but on descending they will close and hold up the hammer. Pressure upon the treadle will lift the end of lever H, which action, as will be seen, removes the front clamp from the board and allows the hammer to fall. A gentle pressure upon the treadle will allow the hammer to go down slowly, but it will stop and remain suspended at any point as soon as the pressure is removed. The clamps in holding up the hammer keep the board from touching either roll and prevents the same from being worn uneven.

These drops are manufactured by the Stiles & Parker Press Co., Middletown, Conn.



The tables are turned. Not many years ago a large portion of the toys used by the children of America came from Europe. But now not only are the many inventions which have originated in our country sought by foreigners, but toys formerly made abroad are manufactured more cheaply here, and the old world buys largely from the new. Last year the export trade in toys was over $1,000,000. American steam toys and mechanical toys have rapidly multiplied within a few years and are exported in large quantities. So also tin and wooden toys which much excel European products in style, finish and cheapness.—*Harper's Bazar.*

As an example of the good feeling that ought always to exist between employer and employed we notice in the *Zanesville* (Ohio) *Signal*, of a recent date, an account of the presentation of a fine gold-headed cane to Mr. F. J. Korte, Superintendent of the Muskingum Valley Machine Works, by the employees of that establishment, as a testimonial of their esteem and gratitude, and for his kindness and impartial manner of treating them. Pleasant little speeches were indulged in, and a repast was spread, "to which each and all did ample justice."

The American workmen who went to New South Wales heartily wish they hadn't. Hardly a dozen of one party of 362 are earning as much as they did at home.

John Robertson & Co., Brooklyn, are building hydraulic presses for making raised figures on ware for silver plating. Some very beautiful pieces are produced with all the accuracy and clearness of an engraving.

The Mechanical Drawing Board.

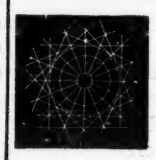
This is the first practical Drawing Board ever made, where, by the revolution of the board on its own center under the T-square, a certain number of mathematically correct divisions are made automatically. This is done by means of a graduated circle attached to its under surface. The number of divisions are not limited, but for common designs and working drawings for Architects and Engineers in almost all departments, and for Patent Office Drawings 16 divisions are sufficient.

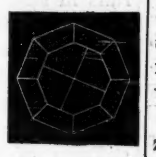
For fine perspective and shading a larger number may be required, which may be obtained by making more divisions on the circle or index plate. Several boards with circles of different graduations attached may be used on the same frame (as they are all interchangeable), which would be very desirable in different kinds of work. One index may also be used having different graduations upon it. The cuts show specimens of work done by an index plate 16 and 48 divisions. This arrangement requires an additional lever for its operation.

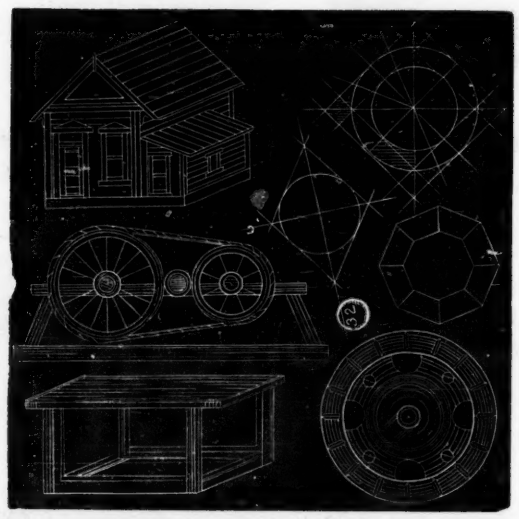
All the straight lines and divisions shown in the cuts are made simply by the assistance of the T-square, and of course many other combinations can be made by the same means.

The simple fact that this board is mounted on a frame and is made to revolve on a center is worth, to any draughtsman, ten times the price he has to pay for it.

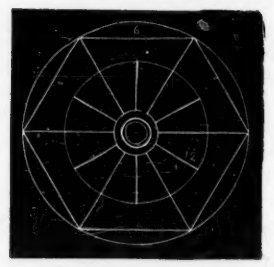
The action of the index is entirely under the control of the operator by means of the *trigger catch*, situated under the *parallel* which supports the T-square, by means of which,







THE MECHANICAL DRAWING BOARD.



the *stop-lever*, which engages with the graduation of the circle, is allowed to remain in contact with the circle or not. But this *stop-lever* is made to work automatically also, so that the board may be revolved without the necessity of moving the lever by the finger.

Any mechanic who is deficient in the art of draughting, as many are, will find that, with the assistance of this board he can make his own drawings with the greatest ease ; in fact this board will teach him to draw, without the necessity of a set of draughting tools, for he needs nothing but the T-square, pencil, pen and compasses to strike his circles with, and perhaps a scroll-form for irregular figures.

The Board may be made to turn easy or hard by adjusting the wooden pin under the bottom. To put on the paper, first dampen it very evenly with a sponge or cloth on one side, and break it over, and tack or fasten it to the edges of the board. With ordinary care the mechanical part of this board will last a lifetime.

Except on special order the size of the boards will be 12½ by 18 inches.

They are manufactured by the MECHANICAL DRAWING BOARD CO., No. 8 Beekman Place, New York.

What an ass the man was who expected to get a horse power out of a donkey engine.

An Improved General System of Teaching the Mechanic Arts in Schools and Colleges.

BY JAMES H. MONCKTON.

The present method of imparting mechanical art knowledge, in the few schools and colleges where such attempt is seriously made, falls far short of what is due to the genius and practical ability of Americans. Too much reliance is placed on foreign ways and means of giving instruction. French and German drawings, that are drawn to a metrical system not in use here, are made use of to instruct Americans, and when the drawings are accompanied by explanations they are in one or the other of the above languages. Another most important objection to such drawings is their clumsiness of design, their awkward appearance, and the unnecessary amount of material and of unrequired labor that in some cases is fearful to contemplate. If any doubt this statement let them go to the sources of our supply—houses that import foreign mechanical drawings—and examine for themselves. Let them look at their drawings of stage coach, railway car, locomotive, common reciprocating engine, or other machinery, and they will find this statement true. I am not unmindful of the existence in this city of a Cooper Institute, and the good man's good works carried on within its walls. I know, too, that there are in that Institute many well-built models and mounted construction drawings that cost the benevolent donor many thousands of dollars. These hang around and are stowed away on shelves, and appear generally to be kept as in a museum for the curious gaze and wonder of visitors and students. It is noticeable, also, that these drawings and models are of German or French make, and in character and design as above described.

There are also other public institutions in this city proffering free instruction in mechanical drawing, whose means of educating are mainly drawn from foreign sources.

What we need is a live, American plan of giving instruction in mechanic arts. We need in all our schools and colleges American drawings of original American designs, accompanied in every case by models, both to be lettered alike, with complete explanations in all practical details. The extent to which proper models and drawings ought to be prepared may be briefly stated as follows: Ships of iron and wood, the models to be of such form of construction as to exhibit the ribs and covering, and together with the drawings and detail explanations be suitable for an apprentice or workman at the art of ship building, to rapidly acquire a complete scientific and practical knowledge of the work (except the use of tools), but even drawings of tools in the case of apprentices may be very properly introduced. And here should likewise be models and separate sectional parts of marine and stationary steam engines, steam fire engines, and steam pumps; models of some of the most important machines used in the arts and manufactures; various examples of machine gearing, all to have complete working drawings carefully lettered and explained in full detail; models of dwellings and public buildings, with elevation and detail construction drawings ; examples of such portions of work in carpentry and joinery as require special geometrical knowledge, such as groined ceilings, domes, splayed work, the wreaths required in hand-railing for staircases, construction of roofs, etc., all to have properly prepared working drawings, with complete explanations ; models and drawings of bridges, with carefully lettered detail instructions ; such models as may be required to exhibit the exact mode of measuring the human form for the purpose of cutting clothing, boots and shoes, to be accompanied with all necessary drawings and explanations in detail; the models and drawings to be lettered or figured alike and in the best manner for quick reference and rapid, practical instruction.

In the professions, the surgeon does not rely wholly on even the most perfect drawings for imparting instruction, but introduces the human body, dissecting it in the presence of his students, who by this means acquire a rapid and complete knoweldge of its structure. The chemist, as educator, does not stop with mere verbal explanations, charts and symbols, but gives practical exemplifications of the various changes, combinations and results treated of. Our Patent Office officials require all drawings of new mechanical inventions to be accompanied with models. Now if models are necessary to the skilled professor, how much more are they necessary, even for common mechanical devices, to the unskilled student or apprentice ?

Should some public-spirited American citizen, or some downright earnest institution, embark sufficient capital to generally cover the requirements in the line of instruction suggested in this article, there need be no fear that the sale of copyrighted duplicates, wherever the English language is spoken, will not yield a handsome profit, beside doing a lasting good work.

How to Make a Good Mechanic.

In order to make a good mechanic, the head and heart and hand must work together. The heart desires, the head plans, the hands execute. Now, along with this, remember the advice written centuries ago by a wise scientific man : "Whatever thy hand findeth to do, do it with thy might."

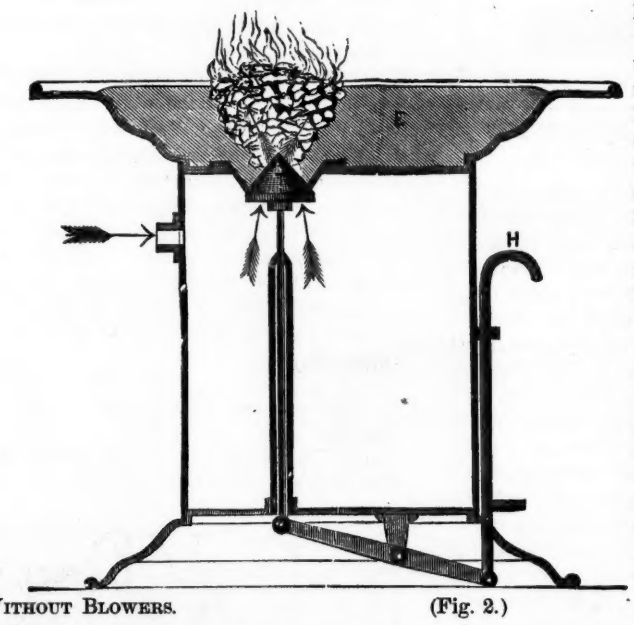
Depend upon it, success in life depends mainly upon carrying into practice this excellent advice. If you take up one piece of work, and carelessly and listlessly play at doing it, and then lay it down to begin with equal indifference something else, you will never become either a good mechanic or a useful man. If you read of those who have been great men, you will generally find they became such simply by their observance of that ancient precept of the wise man. A young man who intends to become a good mechanic must keep not only his habits good, but his nerves steady. Shun the twin vices of drinking and smoking. These things waste time, money, and health ; and are not necessary either to true comfort or happiness, but are enemies of both.—*Scientific News.*

If the figures of the Bureau of Statistics are correct, the United States exported merchandise, month before last, to the aggregate value of $64,416,219, besides $1,464,854, of coin and bullion. The total importation of merchandise in the month was $36,244,901, and of specie $2,248,147 ; total excess of November exports over imports, $27,388,025. The excess in the corresponding month of 1876 was $24,728,482. In the eleven months ending Oct. 31 we exported, all told, $596,338,653, and imported $471,633,750; balance on the right side, $124,704,903.

Patterson's Improved Forges.

Patterson's Patent Portable Forge has been in use since 1866, and has given satisfaction where used by practical workmen. The forge is very compact and durable. It consists of a hearth and base of cast iron, connected by a substantial wrought iron body. The tuyere is simple and indestructible. No water is required to keep it from burning out, and it is so arranged as to be lowered to clear the fire or to allow of a large volume of blast for special occasions. The tuyere is perforated and is made adjustable, so that the blast reaches the fire either through the tuyere or around it as desired. The ashes are dropped into the body of the forge, and afterwards removed through a door at the base. The larger sizes may be with great advantage substituted for the ordinary brick forges. Nos. 1 and 2 are furnished with a patent blower, consisting of a single brass wheel, which discharges into the body of the forge, which serves as a reservoir for the air. These, and larger sizes, are also furnished with an iron-cased piston bellows. It can deliver a blast three inches in diameter without in the least clogging. This cannot be accomplished with any other forge without infringing on Patterson's patent. Fig. 1 represents the external portions of the forge, its handle, door, reservoir, and burning coal. Fig. 2 shows in sections the interior of the forge; E shows the hearth in the table, and T the conical perforated tuyere; H the handle for manipulating the tuyere in freeing it of ashes and cinders; the arrows indicate the wind blast from the blower or bellows into the reservoir, which produces with a soft blast an intense and even heat.

(Fig. 1.)



(Fig. 2.)

PATTERSON'S FORGES WITHOUT BLOWERS.

For many purposes the bellows is preferable. The piston bellows is more desirable than the ordinary form, for it is complete in itself and requires no frame, and may be placed anywhere, even at a distance from the forge. Having an iron case it is not easily injured, and if injured is easily repaired. It has also greater capacity in proportion to size, and is quite as cheap as a wood and leather affair.

They are for sale by the George Place Machinery Agency, 121 Chambers and 103 Reade street, N. Y.

Plumbago as a Lubricant.

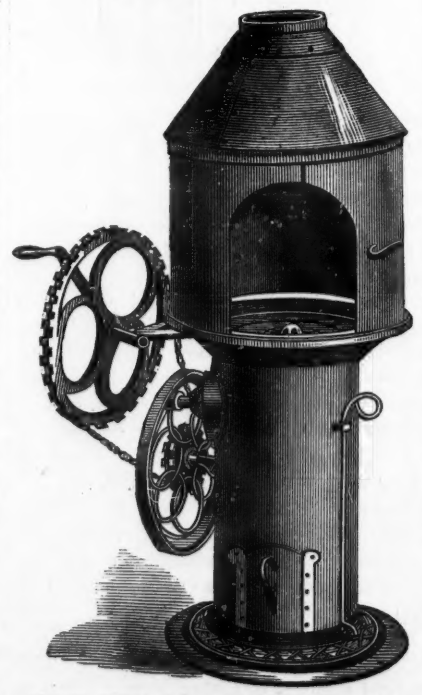
The allusions made to the use of plumbago as a lubricant by the writers on friction, are not sufficient to stimulate inquiry or materially increase its use. They surely do not give the impression that it is an article which might be used advantageously and economically wherever friction exists. The discussion of the questions involved in the reduction of friction is only of practical importance insomuch as it serves to lead towards the best means to secure the greatest possible economy, in saving the power which is consumed and wasted in overcoming the resistance of friction dependant upon in sufficient or improper lubrication, and as it seems to create an interest in the subject which leads to investigation. A knowledge of what has been written, and of the conclusions reached by the writers on friction, may prove of interest, and in the absence of anything better their conclusions may be accepted as laws, however very faulty and far from being fixed and invariable. The real question of importance to the users of machinery or mechanical power, is not what is the nature of friction? Or what the laws that govern it? But what is the best and cheapest lubricant? What bearings are the best? Most of the practical efforts for the solution of these questions, since the times of Amontons, have been directed towards the improvement of bearings, and, as a consequence, the average loss by friction as stated by Coulomb in 1799, at one quarter of the pressure has been reduced to one-tenth; an amount of saving that if computed would be almost beyond comprehension. I think it was Greeley who said that "a man who makes two blades of grass grow where one grew before, is a public benefactor." And so we may say of the man who will save a percentage, no matter how small, of the loss incurred by excessive friction. That it can be done by any improvements in the oils or lubricating compounds in common use we very much doubt. In plumbago we find an answer to the questions—plumbago, free from impurity and properly prepared. We have, no doubt, but that the difficulty in securing it in this condition has prevented its more general use, and its use mingled with impurities, which are frictional elements, has justly prejudiced many against it.

Recently experiments have been made with an anti-friction metal, composed in considerable part of pure plumbago, which was substituted for the brass boxes ordinarily used on the testing machine with results most remarkable. We deem them of sufficient interest to give one day's run almost in detail. We quote from the log which was made up by one of the most skillful scientists and experimenters in this country.

The test began with 33 lbs., total pressure upon the bearing temperature 80° F., the axle running at a speed of 720 revolutions a minute; of the 33 lbs. pressure, 9.3 lbs. were lost in friction, which gave a co-efficient of friction .283. At the 14th minute the temperature had risen to 135°, and the co-efficient had dropped to .272; at the 26th minute the temperature had increased to 158°, the co-efficient had not changed from the 27th to the 39th minute, the co-efficient was .262, and the temperature 160° from the 31st to the 60th min. the co-efficient was .252, and temperature increased to 170°. As the temperature reached its highest, 170° at the 45th minute, and the co-efficient remained steadily at .222; the test at 33 lbs. pressure was concluded, and the pressure increased to 66 lbs. total pressure, and the velocity 720 revolutions per minute. Temperature 170° F., co-efficient was 210°, and the co-efficient, 10. At the 5th minute the co-efficient was .096. At the 7th minute .079, and steadily declined until at the 20th minute it was .066, and the temperature had reached its highest, 258°, from which point it steadily decreased to the end of this portion of the test until it reached 210°. At the 42d minute the co-efficient had declined to .048. At the 53d, .045, and as the day was nearly spent the test at 96 lbs. was ended. The pressure was then placed at 150 lbs., and the speed of 720 revolutions continued. At .232; at the 24th minute the co-efficient was .217, and the temperature 210°. At the 38th minute the temperature reached its highest, 225°, at which point it remained until the 63d minute, and decreased gradually until the 123d minute, when it was 190°, and the co-efficient gradually decreased to .151, and as no change was noticed at the 133d minute the speed was increased to 2,000 revolutions a minute, and the test continued. At the end of the 134th minute the co-efficient was .121; at the 136th minute the co-efficient was .10, temperature 210°; at the 137th minute, co-efficient was .09, and remained stationary until the 149th minute, at which time the co-efficient was .084, the temperature 223°; at the 166th minute the co-efficient was .073, the temperature 230°. As the co-efficient remained the same and the temperature gradually decreased to 225° at the 175th minute; the test at 66 lbs. pressure was discontinued at the 185th minute. The pressure was then placed at 96 lbs., and 720 revolutions per minute. At the beginning the temperature point it remained until the 50th minute, when the test ended. It seems difficult to reconcile the results of this test with the principles and laws enunciated by the different writers on the subject of friction. With us it serves to confirm a conviction that has been gaining strength, that there are some unknown factors in the problem which must be discovered and understood before we shall have a law fixed and invariable.

F. W. P.

PATTERSON'S FORGE COMPLETE.



FORGE WITH HOOD FOR HAND POWER.

Professor Reauleaux, of Berlin, generally regarded as the first of mechanical engineers in his country, if not in Europe, and a man also of broad accomplishments and excellent judgment in other branches of industry and art, has just published in book form a series of letters upon the industrial position of the United States, written during a visit to the Centennial Exposition last year, in which he says the wealth of our country in coal and iron is such as Europe furnishes no paallel for. In regard to machinery, it is frankly admitted that the United States has begun to occupy "one of the places in the first rank, in some respects the very first." In tool making, especially, they "carry away the palm, not only at the exhibition, but seemingly everywhere." To this complimentary summing up Profess'r Reauleaux joins an enumeration of the specific merits which distinguish American tools, which have got far beyond German products in this line, and have even "hurled the English out of the saddle." In this connection particular reference is made to American weaving machines, machines for working wood, labor-saving machines of all sorts, and especially to printing presses. Of our future development in industry and art, he maintains that there can be no doubt, because we have education, great mechanical skill, know how to use machinery to advantage, and have natural resources far superior to anything known in Europe.—*Bulletin of the Iron and Steel Association.*

The *Textile Manufacturer*, England, says Mr. Aitkin, of Helmshore, near Manchester, has taken out patents for cotton belting. The belts themselves are woven in a peculiar manner from doubled yarns, and may be made of any length and size from forty-eight inches wide and one-half inch thick. After being woven they are saturated with water and stretched, and, while still extended, they are dried; in fact the moisture is driven off by a drying cylinder in the process of stretching. The belts are now passed through a heated liquid preparation, somewhat resinous in its nature, with the object of giving them a degree of solidity, and the excess of the mixture is removed by passing the belts between rollers, after which they are again allowed to dry. If required, for the sake of appearance, they may now be painted, but this is not recommended by the inventor. The belts, when put to work, do not stretch, practically, at all, the first belt made, over sixty feet long, doing good work for over two years before requiring to be taken up. There is not the slightest tendency to fray on the edges. They run with remarkable truth, having but one joint, and do very heavy work, a 3½ inch belt driving two throstle frames, with 420 spindles. The joint in the belt is made in the ordinary way, by punching and lacing the two ends together. It is claimed that this cotton belting will do the work that any other kind will, and that it acts satisfactorily where some belts will fail, while, on the score of economy, it is the cheapest made.

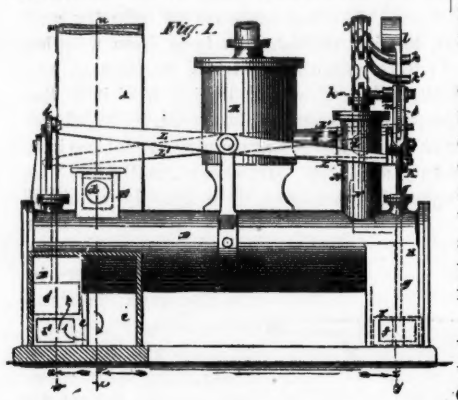
The Freeland Tool Works, New York, have a new friction gearing for running a planer by two belts, without shifting.

IMPROVEMENT IN AIR-COMPRESSORS.

Specification forming part of Letters Patent No. 198,067, issued to BENJAMIN T. BABBITT, New York, N. Y.

This invention relates to apparatus for condensing or compressing air to be used as a motive agent, or for ventilating shafts and mines by hydrostatic pressure as derived from a column or head of water—as, for instance, from a water-fall or natural stream.

The invention consists in various novel constructions and combinations of parts in such an apparatus or engine, whereby a very efficient and automatic action is obtained and a continuous supply of compressed air is

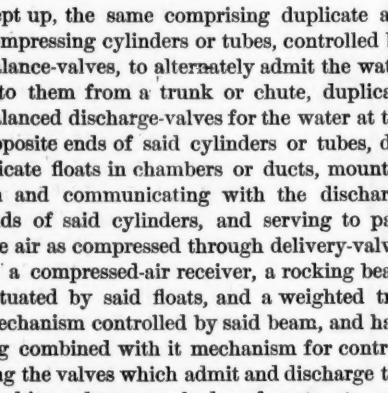


kept up, the same comprising duplicate air-compressing cylinders or tubes, controlled by balance-valves, to alternately admit the water into them from a trunk or chute, duplicate balanced discharge-valves for the water at the opposite ends of said cylinders or tubes, duplicate floats in chambers or ducts, mounted on and communicating with the discharge ends of said cylinders, and serving to pass the air as compressed through delivery-valves to a compressed-air receiver, a rocking beam actuated by said floats, and a weighted trip mechanism controlled by said beam, and having combined with it mechanism for controlling the valves which admit and discharge the working-column or body of water to and from the air-compressing cylinders or tubes.

Such apparatus constitutes a very convenient means of utilizing a copious supply of water to the compression of air, which may be transmitted to any desired distance from the water-supply.

Figure 1 represents a side elevation of an air-compressing apparatus constructed in accordance with the invention. Fig. 2 is a vertical section on the line *u u*, looking in direction of the arrow *v*; Fig. 3, a transverse section on the line *w w*, looking in direction of the arrow *x*; and Fig. 4, a further transverse section on the irregular line *y y*, looking in direction of the arrow *z*.

A represents a trunk, chute, or water-receiving duct, which may be of any desired height and capacity, and which serves to conduct the water from a natural stream or fall alternately to duplicate valve-chambers B B′ on opposite sides of, and at the base of, said chute by means of apertures *b b′*, arranged on opposite sides of each of said valve-chambers, and communicating, not only directly with the chute A at its base, but also indirectly therewith, by connecting chambers or passages *c*, to produce an opposing or counterbal-



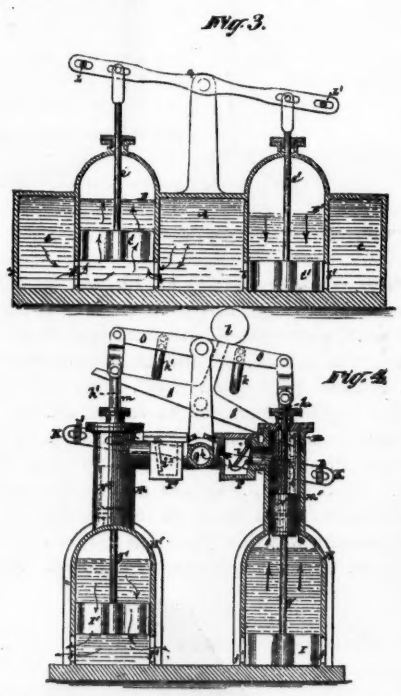
ancing lateral pressure on the valves C C′, which have an alternately reverse up-and-down movement within the chambers B B′ to control the apertures or ports *b b′*. This combination of ports and passages serves to relieve the valves of friction. The valve-chambers B B′ are in free communication with the forward ends of duplicate horizontal air-compressing mains, cylinders, or tubes D D′, which may be of any desired length and capacity, and which, when either valve C or C′ is operated to uncover the ports *b b′*, which it controls, receive water under pressure from the chute A to compress the air within them.

Mounted on the air-compressing mains or cylinders D D′ are boxes or ducts E E′, provided with valves *d d′*, opening inward to admit air to the interior of said mains; but which close when the air is being compressed within the mains by the action of the water as it is admitted alternately to either main by the valve C or C′.

G is a rocking beam, to opposite ends of which the up-and-down reciprocating or sliding valves C C′ are connected by means of rods *e e′*.

At the back or opposite ends of the air-compressing mains or cylinders D D′ are valve-boxes H H′, in which are arranged slide-valves I I′, for controlling the discharge of the water alternately from the mains D D′, after it has done its work in the latter. These valves also have an up-and-down movement, and are counterbalanced as regards lateral pressure, and control opposite end outlets *f f′* for the water.

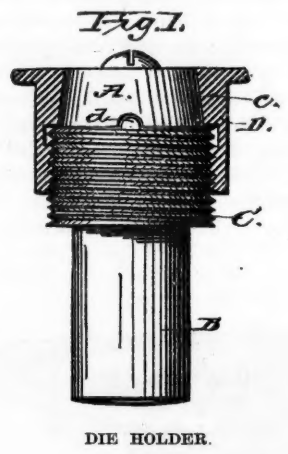
K is a rocking beam, to opposite ends of which the rods *g g′* of the water discharge valves I I′ are connected. The rocking beams G and K are connected at their opposite ends by duplicate side rocking beams or levers L L′, to insure a proper relative action of the inlet-valves C C′ and outlet-valves I I′, so that when either inlet-valve C or C′ is open the discharge-valve I or I′, at the opposite end of the same main D or D′, is closed, and vice versa, and so that each main is filled and emptied alternately.



Mounted on the mains D D′, near their back ends, are chambers or ducts M M′, which contain loosely-fitting floats N N′, and are in free communication at their lower ends with the mains D D′. These floats are connected by rods *h h′* with opposite ends of a rocking beam, O, to secure their joint action in reverse directions. The upper end portions of the chambers or ducts M M connect with valve-boxes P P′, which are fitted with air-delivery valves *i i′*, opening inward, and connected by a branch, Q, with a compressed-air receiver, R, from which the air, compressed by the apparatus, may be taken or conveyed by pipe to its place or places of use.

Attached to the rocking beam O, on opposite sides of its center of motion, are toes *k k′*, which, as said beam is rocked, alternately rub over or act upon opposite ends or arms of an independent rocking beam, S, which carries or has mounted on it, over its center of motion, a tripping or tilting weight, *l*. This weighted tripping or tilting beam S is free to move at its outer ends in slotted upper extensions *m* of the valve-rods *g g′*.

The operation is as follows: Supposing water under a head or pressure, as from a running stream or water-fall, to be freely supplied to the trunk, chute, or receiving-duct A from above, and the valve C′ closed, and the valve I to be closed and valve I′ to be open, the said water will rush into the main cylinder or tube D at its forward end, and filling said main, also rising within the chamber or duct M, will compress the air previously received within the main D by its valve *d*, and drive out said air through the valve *i* into the compressed-air receiver R. During this operation the float N rises in the chamber or duct M, and, rocking the beam O, causes the toe *k* on the latter to bear on and move the weighted tripping or tilting beam S till the weight *l* of the latter passes its center of gravity, and the beam S is suddenly tripped or tilted, so as to close, by its action on the slotted extension *m*



DIE HOLDER.

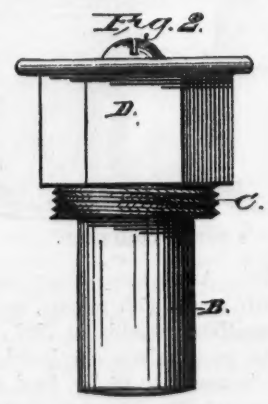
of the rod *g′*, the water-discharge valve I′, and at the same time, by means of the connected rocking beams K G and L L′, to open the water-discharge valve I, to close the valve C, and to open the valve C′. This reverses the action of the apparatus or causes the main D′ to become charged with water, and to drive out the air which it compresses therein through the valve *i′* into the receiver R until the float N′, rising in its chamber or duct M′, operates through the toe *k* of the beam O on the tripping or tilting weighted beam S to reverse the position of the latter, and by its action on the slotted extension *m* of the valve-rod *g* and the beams K G L L′ causes the valve C again to be opened, the valve C′ closed, the valve I closed, and the valve I′ opened. This runs out the water, which has done its duty from the main D′, and resupplies the main D with a fresh charge of water to keep up the air-compressing action, which is thus made continuous and automatic.

Claim—

1. The combination, with the duplicate air-compressing cylinders or mains D D′, of the water-trunk or receiving duct A for supplying said mains, the valve-chambers B B′, having ports *b b′* in their opposite sides, the connecting chambers or passages *c*, and the slide-valves C C′, substantially as specified.

2. The combination, with the air-compressing cylinders or mains D D′, which operate by alternately charging them with water to compress the air within them, of the upright chamber or ducts M M′, near the discharging ends of said mains, the floats N N′, the tripping or tilting weighted beam S, set in motion by said floats, inlet and outlet valves for the water at opposite ends of said mains, and the mechanism connecting said valves and actuated by the tripping or tilting weighted beam, essentially as and for the purpose herein set forth.

3. The combination of the side rocking beams L L with the end rocking beams G K and the water inlet and outlet valves C C′ I I′ of the apparatus, substantially as specified.



DIE HOLDER.

IMPROVEMENT IN HOLDERS FOR SCREW-CUTTING DIES.

Specification forming part of Letters Patent No. 197,984, issued to FRANK P. SHELDON, of Providence, Rhode Island.

Figure 1 is a longitudinal section through the axis. Fig. 2 is a side view; and Fig. 3 is a front view.

The purpose of this invention is to provide a means for both securely holding a die, such as is used in cutting fine-threaded or machine screws, and also to insure the proper adjustment of the die in the holder, so that its central axis will always coincide with the longitudinal axis of the die-spindle.

Heretofore dies of this character have been set in their holders and secured therein, as well as their proper position determined, by means of an adjusting screw or screws applied to the sides of the die. As a necessary consequence great care is required in setting the dies, and they are very liable to become displaced in position.

In the drawings, *a*, Fig. 3, represents the front view of the cutters of a die, provided with the usual clearances *b* for the chips. The die-block A is made frustro-conical in form; and with the tools at present in use in machine-shops it is easy to make the central axis of the die in exact coincidence with the central axis of the die-block.

B is the die-spindle, which is constructed with a screw-threaded end, C. The end of the spindle is to be covered with a cap, D, a portion of its interior being provided with a thread, which fits the thread on the end of the spindle. Another portion of the cap is formed into a socket, *c*, for the die-block, which is in the form of a hollow frustum of a cone, exactly corresponding with the shape of the die-block, but of somewhat less thickness than the die-block, in order that when the die-block, the cap, and the spindle are combined, as shown at Fig. 1, and the cap screwed down hard, the walls of the socket will be sure to clamp the die-block firmly against the

end of the spindle, and wedge the die-block securely in the socket.

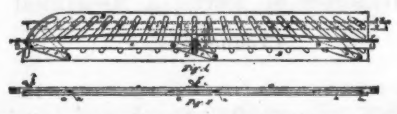
For preventing the die from turning around in its socket, is provided a raised tongue, *d*, across the end of the spindle in a diametrical line, and cut a corresponding groove or channel across the back end of the die-block. It will be possible, however, to employ a part of this invention by making the die-block in the form of two cylinders of unequal diameters and the socket to correspond therewith, so that an annular lip would be made on the front end of the socket, to prevent the die-block from being pulled out of the socket. In such case the tongue-and-groove device to prevent the die from turning would be very important.

With this construction of the die-block and holder, the most inexpert workman can put a die in position, and be certain that the die will be located in its proper working relations. Besides, too, the joint between the socket and the die-block is so close as to prevent any chips from working into the socket, and therefore no time is consumed in cleaning the socket when a new die is to be inserted.

The inventor is aware that threaded stocks and coupling-nuts have heretofore been employed for connecting punches with their stocks in punching-machines; and does not, therefore, make claim herein to the threaded spindle and the die-socket *per se*.

What is claimed as this invention, and desire to secure by Letters Patent, is—

The combination of a die-block, a holding-socket, and a spindle, substantially as described, with a tongue-and-groove connection, *d*, between the spindle and the die-block, as specified.



IMPROVEMENT IN ADJUSTABLE TEMPLETS FOR LAYING OUT BOILER PLATES.

Specification forming part of Letters Patent No. 195,721, issued to James Morgan, of Pittsburg, Pa.

Figure 1 is a top-plan view of an improved adjustable templet, and Fig. 2 is a rear elevation of the same.

In laying off boiler-plates for punching and riveting it has heretofore been customary for the workman to make use of a separate set of templets for each different size or form of boiler made.

This improved adjustable templet is designed to take the place of these various patterns or templets, as, by means of its possible adjustments, it may be used to lay off the different points for punching on all the various plates which come within the range of ordinary boiler-making, and it also may be used to advantage where regular or irregular points are to be laid off on either a straight line or a curve.

In the drawings, B represents a metallic plate of any convenient length and width with reference to the use for which the instrument is intended. In this plate are made a series of radial slots, $a\ a^1\ a^2\ a^3$, &c. These slots reach nearly across the plate B, leaving, however, a strip of metal along the edges to give the requisite strength to the plate, and they are laid off from some center outside the plate in such manner that one slot, as a, near the middle, shall be at right angles to the line of the length of the plate, and also so that they shall be equal distances apart on any given line at right angles to the middle slot a. While the distance between slots on such given line is uniform it is not uniform, or the same, on different lines, but decreases as such line is laid nearer the radial point of the slots.

A parallel bar, c, is pivoted by arms e to the face of the plate B, so that it may be moved back and forth across the face of the plate and always preserve the same relation to, or make the same angles with, the slots $a\ a^1\ a^2$, &c. This parallel bar c may be kept in place by means of a pin and thumb-screw, i, set into the bar from the under side of the plate. As the bar is moved on its pivoted arms e, the pin i moves in the slot b. A head or collar on the lower end of the pin i bears against the under side of the plate and keeps the bar in place.

The arms e are pivoted at one end to the plate B, and at the other end to the bar c. Recesses n may be let into the under side of the bar c, in which the ends of the arms e are pivoted and operate. The bar may thus rest upon the face of the plate or near it. The length of the arms e should be such as to carry the bar c over the greater part of the length of the slots $a\ a^1\ a^2$, &c.

The bar c may be used as a straight marking-edge, the slots indicating at what points along the same marks shall be made; it is prefered to combine with this bar c a device by which either a straight or curved marking edge may be had, as desired. This device consists of a spring-bar s, arranged along the face edge of the bar c, where it is held by pins r, which pass through slots in the spring-bar, and also by a slotted plate u, which is fastened to the spring-bar s at the middle of the bar, and passes back over the bar c, to which it may be bound by a thumb-screw w. This plate u is graduated, as shown, and by means of it the spring-bar s may be set out from the parallel bar c, so as to make curves of different radii, along which the marking may be done.

In operation, the pitch or distance apart of successive points being determined, the parallel-bar c is set so that the distance between the slots $a\ a^1\ a^2$, &c., along the face of the spring-bar s shall correspond to that pitch. If these points are to be laid in a straight line, the spring-bar s is placed against the parallel bar c, as in dotted lines, Fig. 1, so as to indicate such straight line. If the points are to be laid out in some given curve the spring-bar s is adjusted in the manner described to represent such curve, as shown in full lines, Fig. 1.

If it is desired to change the pitch or distance between rivets, the parallel bar c is moved forward or backward over the plate B until the distance between the slots $a\ a^1\ a^2$, &c., along the line of the spring-bar s corresponds to the desired distance or pitch. Two such positions of the parallel bar c and spring-bar s are shown in Fig. 1—one in full lines, and one in dotted lines.

Any suitable marking-tool may be employed, as those now in common use.

This improved templet, being adjusted as described, is used by the workman in substantially the same manner as the forms now in common use.

Claim herein—

1. An adjustable templet, consisting of plate B, having a series of radial slots therein, and an adjustable parallel bar, substantially as described, whereby two or more series of points of different pitch may be laid out on a plate.

2. The combination of plate B, having a series of radial slots therein, an adjustable parallel bar, and an adjustable spring-bar, arranged substantially as described, whereby two or more series of points of different pitch may be indicated in lines of different curves.

Extracts from Official Gazette of the Patent Office.

GOVERNOR FOR STEAM ENGINES.

E. A. Sutcliffe, New York. This invention consists of a sleeve supported upon the ordinary spindle, and carrying radial arms and Governor balls in combination with springs, sleeve, swivel-nut, and valve-rod.

COUNTER-SHAFTS FOR DRIVING MACHINERY.

Chas. W. Hunt, West New Brighton, N.Y. This invention consists of a wheel vibrating between the disks of two opposite wheels. These two wheels have the faces shaped like a spherical ring, in which the vibrating wheel is carried.

HYDRAULIC PRESSES.

Francis S. Kinney, New York. *Brief.*—A continuous action of the pump forces the water into a chamber in which the air is compressed. The chamber is connected with adjacent receiving or magazine chambers, whence it may be led and applied to the ram through a pipe.

BOLTS AND NUTS.

Hayward A. Harvey, Orange, N. J. *Brief.*—This invention consists in forming barbed threads on both nut and bolt, so that, when mechanical force is used in clamping the object through which the bolt passes, the threads of the nut will be so distorted as to make it difficult to pass them over the bolt threads below.

NUT AND BOLT LOCKS.

Hayward A. Harvey, Orange, N. J. *Brief.*—At a point on the shank of the bolt, near to the final position of the nut, the thread of the bolt is changed from a regular pitch to a pitch which gradually increases. The thread of the nut has the same pitch as the regularly threaded part of the bolt.

WIRE BELTING.

Carl W. Sturmberg, Elberfeld, Prussia. This invention consists of: 1. A wire belt, constructed of a series of transverse strands, each bent to a zigzag shape, and the whole interlaced, and either with or without an edge facing of leather or similar material. 2. A wire belt, constructed of a series of transverse strands, arranged in groups or sets, each bent to a zigzag shape, and the whole interlaced either with or without an edge facing of leather, or similar material.

MACHINES FOR GRINDING LAWN MOWER CUTTERS.

Edward J. Worcester, Worcester, Mass. *Brief.*—Lateral motion of spiral blade of cutting cylinder between an upper and under roller, the latter having a yielding bearing reciprocates the cutter and its holding frame in their journals, and holds the blade throughout its spiral to the stone. Belt tightened by tipping large wheel. Upper pressure roll may be omitted when spiral blades are moved only in one direction, and is moved out of the way when straight blades are to be ground.

LUBRICATORS.

Frank Callingnon, Buffalo, N. Y. *Claim.*—1. As an improved article of manufacture, a lubricator, provided with a stop valve below and a bell-shaped receiver above, fitted with a screw plug having a square faced seat overlapping a threaded screw shank of less diameter than said valve seat, said screw shank being provided with filling and vent passages, terminating directly below said seat with their exit passage parallel therewith, whereby the escaping gases and lubricant are ejected against the walls of, and collected within, said bell-shaped receiver, all as hereinbefore set forth and described. 2. In lubricators, a bell-shaped receiver, having a valve-seat in the bottom of the bowl, in combination with a screw plug provided with a square-faced seat and filling and vent passages, whose exit passage is parallel with said seat, as hereinbefore set forth and described.

CHUCKS FOR METAL LATHES.

Jas. G. Hallas & Jas. N. Webb, Waterbury, Conn. *Brief.*—All the jaws can be operated simultaneously, in the usual manner, by the toothed ring and pinions. An independent adjustment can be given to a jaw by the mechanism specified in the first claim. Each jaw moves within a bearing, which has a surface slightly above the face of the jaw for the work to rest upon. *Claim.*—The combination of the radially moving jaws, a screw spindle for each jaw, a pinion on each spindle, a gear to connect all said pinions, an externally screw-threaded sleeve on one or more of said spindles, a sleeve internally threaded to receive the first, the combination and arrangement being substantially as and for the purpose described. 2. In a chuck, having radially moving jaws, the combination with said jaws of bearings elevated above the surface of said jaws, substantially as described.

METAL SCREW THREADING MACHINE.

L. L. Worsley, Taunton, Mass. *Brief.*—The spindle containing the die is revolved with a slow motion while cutting the thread, and is quickly reversed when the operation is completed. The clutch for governing the motion of the spindle is actuated by a cam on a shaft, which carries on one end a star wheel, intermittingly rotated by a revolving finger, and provided with teeth of varying degrees of coarseness. The motion of the shaft is slightly accelerated when the finger strikes the coarse teeth, and the cam so turned that it will actuate the clutch. The revolving die is brought up to the blank against the resistance of a spring by the mechanism specified. The arm for feeding the blanks to the clamping jaws is operated by a cam on a sleeve, which sleeve is automatically clutched to its shaft at the time the feeder is to be operated, and is afterward unclutched and allowed to remain stationary, and hold the feeding arm up.

A Cry for Simplicity.

Says an Exchange,—"We are obliged to the New Century Art Publication Company for one of their exquisite chromos, but we feel compelled to return it with the request that they send us some less elaborate study in its stead. The picture "Autumn Scenes on American Farms," is beautiful enough; the atmosphere is marked with a rare transparency, the foreground is a marvelous copy of nature, the perspective is perfect, the high light, middle tint and background are all good, the drawing is accurate and the coloring delicate and natural, and we will say the other things about it when the Company sends us their other art slang. But we cannot hang it up in our house. We have a son, who in all probability will be raised in the city, and we cannot without doing violence to the feelings of a father, permit the hope and staff to our declining years to grow up, and by constant study of that picture, fall into the belief that American farmers, in tight boots and claw-hammer coats, and their wives and daughters in Princesse dresses and Valenciennes lace and kid slippers, go out in the autumn with a pair of blooded horses and a basket phaeton and gather blood-red and golden apples off the same spreading, gnarled and rugged oak tree, glowing in all the flaming splendor of the autumn-glorified maple. Take back your picture, and give us David and Goliah, with green grass and red blood. Don't put in much grass, but pile on the blood."

Over-production.

There are many who believe that the introduction of machinery has caused too great a production of the articles needed for our comfort and the improvement of our condition, and that this trouble can be remedied only by reducing the number of persons who work. A little observation will show that there are many people who cannot procure so much of these things as they wish to have, and would buy if they could readily dispose of their labor, and thus procure the means which would enable them to enjoy the use of the articles which, it is said, are produced in too great quantities. Under the commercial and financial systems which we have established, manufactures are produced to a greater extent than can be sold for money, but this is a result of the condition of business which deprives many persons of the ability to earn money. It is, therefore, more proper to say that "hard times" are produced by the diminution of the power to purchase by the people, than by over-production of the things wanted. Agriculture produces a surplus of food, which finds foreign markets, and a large surplus of raw materials, which also are exported. In agriculture this over-production does not cause distress to those engaged in it; but the profits of this department of industry would be greatly augmented if those engaged in other branches of labor were better remunerated for their work. It is manufactures and commerce which enrich nations, and under favorable circumstances they improve the condition of the people. Commerce should give profitable employment to a part of the people, and should increase the capital, which is needed for all industrial enterprises. Our country produces the substance which makes commerce, but under our financial system this commerce is in the hands of foreigners, who make its profits. A lack of superior skill in mechanical and artistic work prevents the production of many articles of taste and beauty, and large amounts of capital are expended for them. In consequence of this operation of trade we lose the means so much needed to give industrious people employment in developing the resources of our country. When the people are engaged in productive work, and fairly remunerated for it, they wish to have better dwellings, better furniture, clothing and food, as well as books, pictures, musical instruments, and other things which tend to a higher degree of refinement. Then all legitimate branches of business flourish, and production constantly increases, and with it increases the wealth of the country.

The aim of a community, therefore, should be to procure those conditions which will increase the ability of those who work to buy; those who influence popular opinion should endeavor to find what those conditions are, in order that intelligent legislation may prevent any stagnation in business.

One of them is a currency which cannot be expanded or contracted by speculators and gamblers, and which will be sufficient in amount to supply all proper wants and prevent extravagant rates of interest; another is the cultivation of a high degree of skill in productive arts, for skilled labor produces i.. value much more than the rude work of men who have not acquired skill; and yet another is the ability to produce those luxuries which wealthy individuals will buy, and for which much of our capital is now sent to other countries. We have all the varieties of soil and climate, and yet we buy wines, fruits, teas and many other luxuries produced in other lands.

The great inventions in machinery, etc., enable a comparatively small part of the people to produce what is needed for our mere subsistence, and the surplus beyond what is employed for this purpose, under judicious management, should increase the wealth of the country, and improve the condition of the people. When the work of this surplus is properly diversified, we cannot produce too much of what is useful and what is calculated to promote the prosperity and happiness of families.—*Business Advocate.*

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NEW YORK, JANUARY, 1878.

We present this issue of the AMERICAN MACHINIST in an entire new dress of type, having removed to our new office, 75 Fulton Street, where we will be glad to see our friends at any time. We congratulate our subscribers and advertisers on the remarkable success so far attending our efforts to publish a representative journal of machinery and supplies for machine shops.

Dangerous Boiler Tubes.

Legitimate competition in business is both desirable and necessary, as it insures to the public at large more and better goods for any given amount than could be obtained were the production of anything monopolized by a single concern; besides it proves a safeguard against making "corners" and taking unfair advantages by those having undue control of the market. At present, in nearly every branch of commercial affairs, competition is very active, especially since both labor and the products of labor, tact and skill have been in excess of the demand. In some departments of industry competition, which is said to be "the life of business," has been carried so far as almost to prove its destruction. Such a state of affairs frequently hastens on its own remedy, which may be either temporary or permanent; the members of that particular trade or occupation, who persist in remaining in it, come to some tacit or open agreement not to drive each other to the wall. There is another kind of effort sometimes put forth to secure trade which we can scarcely dignify by the name competition. It consists in employing unscrupulous artifices to gain that patronage which could not be secured by open and fair representation or by any legitimate method and not infrequently takes the form of offering for sale an inferior and deceptive imitation of some standard article, with all the assurance that should accompany the genuine. The direct result is that the purchaser is humbugged and cheated; the indirect result is sometimes even more serious. For some months past parties in this city have been buying up old boiler tubes taken from boilers worn out or thrown aside, reheating them in a furnace, then drawing them down one size smaller, cutting off from each end the extra length thereby produced, and preparing them so as to so closely resemble new tubes that hardly any but a skilled mechanic would detect the difference without very close scrutiny. Every tube or flue that has been used comes out more or less worn, it being in some places thinner than in others; scale will perhaps have formed on the outer surface and the inner surface may have been damaged by the fire or be worn by scraping; different kinds of water produce different effects upon the tubes, sometimes "pitting" them and filling the pits with a powder or sediment; lying exposed to the weather and rusting certainly prove very injurious, while the life of the iron may have been wasted before the flues are taken to be revamped. It is the universal opinion of boiler makers with whom we have conversed, that if second-hand tubes are to be used at all, it is much safer to put them in a boiler without reheating or re-drawing. In the process of re-drawing much of the rust and scale adhering to the outer surface of the tube is pressed into the iron, forming weak spots, and the thin spots already existing are elongated and made worse. The unreliability of these re-drawn tubes will be apparent when it is observed that those of the same length and diameter vary considerably in the weight. It is customary for manufacturers of boiler tubes to *stamp each one with their trade mark*, which, to the purchaser, is a standing guarantee that he receives a reliable and trustworthy article; but in this respect the old revamped tubes are alone anonymous.

There are five boiler tube manufacturers in the United States, and one more just starting. They make the best boiler tubes in the world, the Scotch and other foreign tubes being well known as inferior. In addition to stamping every tube with a steel die, every one is also stenciled with paint, with the name or initial of the manufacturer. Were these spurious tubes sent out under statement of their true character, the responsibility of using them would rest with the boiler makers who buy them; but the lithographed circular, mailed by the managers of this peculiar business, conveys no impression that they are other than new tubes, and a guarantee is offered that every flue will stand as much pressure and work as easily as any flues that are made. The offer to sell at a price ten to twelve per cent. lower than the market price of tubes stamped by reliable and well known makers may be an inducement yielded to by some boiler makers, but this is one of the occult causes never reached in a coroner's inquest. Virtually, the verdict is rendered that the boiler gave way because there was something wrong with it or with the engineer, and the victims were slaughtered because they were too near the boiler when it gave way. The Hartford Boiler Insurance Company, state that they have had more claims to settle for damages arising from the collapse of tubes and flues than from any other single cause. The tubes should be as strong as any part of the boiler; if any part is to be cheapened at the risk of efficiency let it be some part that will not compromise the safety of life and property. But, who are putting in these shoddy tubes? A lively and growing business seems to attend their production. So far as we have inquired, boiler makers in this vicinity repudiate them most positively (though several have used them); but, upon good authority, we learn that agencies for their sale were established some time ago in prominent Western cities. It would not be amiss for those purchasing steam boilers, especially new ones, to satisfy themselves as to the kind of tubes they contain, and in view of the spurious stock somewhere in existence, it would be as well to know by whom the tubes were stamped. We learn that old boiler shells have been pulled to pieces by some parties, the plates turned inside out and made over into "new" boilers. Of this we shall give more particulars hereafter. Is it any wonder that boiler explosions are on the increase?

We have in preparation for our next issue, articles on lubrication of machinery, advantages of American machinery and tools, taxation of railroad rolling stock, dangerous boiler shells, condensation of steam, and on Emery wheels.

Rolling Stock Exempt from Taxes.

One of the most familiar sayings of "Poor Richard" is: "There is nothing sure in this world but death and taxes." This may have been true to the letter in his day, but since then such extraordinary progress has been made that the old saying needs revision so far as taxes are concerned. Those who own a few thousand dollars worth of machinery, and a shop that never changes its location, find taxes as sure as the debt of nature; but scores of large, wealthy and powerful corporations, owning millions of dollars worth of machinery and other property, go scot-free from paying any tax upon that portion of it which is mounted upon wheels and kept running regularly out of and into a State, and through numerous counties, towns, and municipalities in each State. A locomotive is worth from $7,000 to $8,000 a passenger car from $4,000 to $8,000; a freight car from $400 to $500. This kind of property is known as rolling stock, and the railroad companies *never pay any taxes thereon*, although when destroyed by a lawless mob the county or State has to make good the loss. A man who owns an engine that supplies power to his shop, has to pay taxes on its value; but railway companies owning an engine that draws a train of their cars has to pay nothing whatever upon it to the tax gatherer. Is there any remedy for this unjust shifting of the burden of taxation? If so, why is it not applied? Perhaps some prominent office-holding politician can answer these questions. As an example, take any great railroad—the New York Central for instance. Its lines lie wholly within the State of New York, and from this city to Buffalo pass through 21 counties. In every city, township, and school district on its route, taxes are levied and paid upon the road, its depots and all fixed property included in the local limits, assessments being made only upon such property. As the locomotives and cars do not belong to any particular locality no assessments are anywhere made upon them, and no taxes are paid. According to Poor's Manual, the N. Y. Central R. R. owns 557 locomotives, 8 dummies, 427 first-class passenger cars, 83 second-class passenger cars, 215 baggage, mail, and express cars and 15,316 freight cars, making a total of 16,035 revenue cars. The total value of the equipment is, according to the same authority, $3,260,000. The other roads in the State have equipments amounting in the aggregate to many millions of dollars more, upon which no burden of taxation rests. It is vain to urge in extenuation, that the capital stock of the roads representing rolling stock, road bed, etc., is taxed, for so is the capital stock of any manufacturing company; yet the buildings, machinery, and equipments are all subject to a direct tax besides. Why should railroad equipments be placed on the free list? This subject opens up a promising field for genuine political "reformers."

Some two years ago it was sprung upon the Legislature in session at Albany by an enterprising New York politician, and for two or three days public attention was invoked to forthcoming investigations of surpassing interest. Suddenly the whole matter was dropped by the daily press as well as by the officials of the government at Albany, and the whole movement was squelched. Now, when taxation bears so heavily upon business interests, a more equal distribution of its pressure should be made, and the railroad companies should be required to sustain their proper share of the burden. If manufacturers would organize a movement to probe this thing to the bottom they would probably bring about a much needed reform, and save themselves many a dollar in excessive taxes. We shall pursue this subject farther in a subsequent issue.

Those who receive a specimen copy of this third issue of the AMERICAN MACHINIST will oblige us by examining it carefully. If it is the kind of paper you want, send us your subscription for 1878. We publish a thoroughly live and independent Journal, and the *only one* representing Machinery and Machinery Supplies as a distinct class of business, and we are gratified at its success.

Advantages of American Mechanical Productions.

A great deal has been said and written lately about the successful competition of American manufactures and productions in foreign markets. Recently the State Department has required our consuls to report the condition of trade in American productions at their respective posts, as well as to suggest means of increasing our foreign commerce.

From these reports it would seem as though our manufacturers were already aroused to the importance of finding a market for their surplus productions; for wherever our consuls might go in search of information, they would, in most cases, find that long before the State Department gave them the hint to "do something for their country," that indefatigable and indispensable diplomat, the American drummer, had preceded them, and we have no doubt that if our State Department had the reports of some of our manufacturers' agents before it, a great deal of *practical, and therefore valuable,* information could be gained by it.

Our manufacturers have for a long time contended against the fixed habits and prejudices of our own people, and they have not only succeeded in convincing them of the superiority and fitness of our various articles of manufacture for the purposes which they were intended for, but they have almost entirely displaced the imported article at home, and are now seeking an outlet for the surplus productions abroad, with a degree of success that surprises every one but our manufacturers themselves, for, with them, it was a mere matter of time; and the time has come at last.

Previous to our Centennial Exposition it was hard work to convince our own people that our wares of every kind were as good, and in most cases better, than those imported. So we could not blame our English cousins for entertaining the same opinion. Since the close of the Exposition all this is changed. They now begin to realize the fact, that by the aid of special and original machinery, operated by workmen skilled in each separate branch of business, a most thorough and well-organized system of manufacture has been adopted, and that the articles produced by means of such a system are much superior and a great deal cheaper than articles made "the old way."

The present high standard of our machinery is due entirely to this system of making special tools for each part, *by which they are made interchangeable,* thereby producing an article of uniform quality in indefinite numbers, and without the slightest variation in style or finish. In no branch of our manufactures is this system so thoroughly understood and practiced as in the machine-shop, for it is there that all the machinery which sets in motion the numerous other branches of industry is designed and manufactured.

To answer the question, why are our American machinery inventions and productions wanted abroad? We will have to give a more definite answer than the one usually given, "because they are better and cheaper." We propose to show wherein our various articles of manufacture differ from similar articles made in other countries, and to prove—

1st. That they are much superior and artistic in design, and better adapted to meet the requirements for which they were intended.

2d. That they are as good, and in most cases better and cheaper.

To do this, it will be necessary to describe the different processes of manufacture, as well as special points of difference which distinguish our productions from all others.

Our lathes, at first sight, do not appear to differ materially from those made in Europe, but it will be found upon closer examination, and by running one a short time, that there is *a great deal of difference.* It will be found that the gear teeth are *accurately cut and numbered,* and fitted *closely* to their spindles. The feed-screw will be found *perfect throughout its entire length.* The adjustable tool-post for raising and lowering the tool *without removing it* will be found a very convenient and useful improvement.

A quick, simple, and positive method of throwing the tool-carrier in and out of gear with the feed-screw, as well as the simplicity with which the lathe is thrown in or out of gear, are important features. The style and finish, together with the *time and labor-saving* devices mentioned, make our lathes recognized as American lathes all over the world, and they will sell wherever there is intelligence enough to recognize the difference.

Lathe-chucks of various kinds are made by us, and have been exported to Europe for some time past.

The universal chuck is of American origin, and is recognized in Europe as the American chuck.

Twist-drills and drill-chucks have performed a very important part in the advancement of American manufactures, and lest full justice should not be done a few remarks on this all-important tool will be in order :

It will be remembered by our oldest machinists (and the older he may be the more cause he will have to remember it), that in order to drill a hole of considerable depth and size, a great deal of skill and preparation was required to produce a perfect hole with the old style flat drills. After getting the center and laying off the circle, caution was required to guide it in the center until it had gained a start ; it started on its course relying on its center alone to guide it ; it scratched its way along, as its construction prevented any thing like a cut, and woe betide it, if any thing like a bad place in the casting came in its path (and in those days the castings all had bad places in them), you would be sure to either break your drill or break your temper, endeavoring to pass the imperfect place.

With our improved twist-drills all that trouble is overcome. They will bore into cast iron like cheese, and make a perfect hole, regardless of sand or blow holes. The success of the sewing machine as well as other light machinery is due, in a great measure, to the rapidity and accuracy with which the twist-drill performs its work. After a long trial here, and the successful results declared, it was still a difficult job to introduce them into England. An agent who tried to canvas the English shops for the sale of twist-drills, was met by a foreman, with the rebuff : "Go to 'ell with your bloody Hamerican gimlets ; they woden't make a 'ole in a turnip." Imagine the surprise of this agent, when visiting this shop six months later, to find them drilling holes in steel with these "Hamerican gimlets." They had, in the mean time, got their eyes opened.

It would be difficult now to find any kind of a decent shop in Europe that is not using our drills and its necessary appendix, the drill-chuck.

Our drill-presses are more numerous in design than lathes, as a wider range is allowed in the distribution of their parts. The designs are most pleasing to the eye, as in the goose-neck style, where all of Hogarth's lines of beauty are produced artistically ; yet each curve and crook meaning something, and performing its important function. The many spindle drill-press is an indispensable tool where a number of holes of different sizes are to be drilled without removing the work. There is a large variety of this class of presses, and some of them wonderfully perfect.

We will continue this subject in our next, as it takes such a wide range that it would be impossible to treat it with any degree of fullness in a single issue.

There are many manufacturers of machinery, who are noted for originality in their productions, but a great many more imitate the designs and inventions of their more progressive competitors. Even a name chosen to designate a peculiar tool or machine is frequently appropriated by a rival, and applied to an imitation of the article. While every manufacturer should watch the designs and improvements of his competitors, thereby gaining fresh ideas to aid him in any new departure from established methods, shapes and processes, it should be his pride and ambition not to travel in the footprints of his rivals in business.

Starting Apprentices.

BY J. J. GRANT.

If parents or guardians would consult the wishes and inclinations of boys before placing them at a trade, and not apprentice them simply because an opportunity offers, no matter whether the trade is in accordance with the boy's natural bent or not, how seldom should we hear, what we often do hear, "If I had only been a carpenter, machinist, or some other kind of an artisan, I would have been a better workman ; I never wanted to learn this trade, I wanted to learn some other."

Of course there are some who are dissatisfied no matter in what station of life they are placed ; but if boys were allowed to select a trade for themselves, there would be fewer bad or indifferent workmen, and fewer dissatisfied men.

I will consider only those about to become apprenticed to the mechanical or machinist's business. To become a good machinist, (and a poor one is worse than none), requires a natural taste for the business, which, as a general thing, manifests itself early in life, by the way the boy handles such tools as may be placed within his reach, and by his fondness for tinkering. Many a man who is a poor merchant, would make a good mechanic, and *vice versa*.

Having discovered the natural desires of the boy for a mechanical business, he should be encouraged therein by every possible means, until old enough to be apprenticed. The next thing is to find a suitable shop, which should be selected not on account of its size but for the reputation it bears for doing only first-class work. The largest and best equipped shops are not always the best, as some of our best mechanics served their time in small shops. If the boy has the natural ability and is under a skillful workman, that is all that is needed. The boy having such a place secured for him and apprenticed in it, should of course do his best to improve his time, remembering that if he works for the interest of his employers he is working for his own, as these interests are identical. He should be prompt and do any job cheerfully although it may be disagreeable. Boys so doing will certainly win the regard of their employers and stand a better chance of promotion than those who shirk and loaf away their time. He should always strive to do a job as quickly as possible, but never sleight it for the sake of doing it quickly, remembering the motto, that "whatever is worth doing at all is worth doing well." He should learn to use all tools carefully, as they cost money, and to clean and return them to their proper places as soon as done with. A few tools such as rules, calipers, dividers, squares and hammers are indispensible, and should be purchased as soon as his apprenticeship commences, as workmen do not like to lend tools, especially to boys. The boy should not rely on his own judgment but should get a good workman to pick them out. It is a mistake to attempt to make them as they can be bought much cheaper and a great deal better than any other but an experienced hand can make them. The time spent in making such tools can be better employed in studying mechanical drawing, a thorough knowledge of which is of great benefit. Finally, the intelligent apprentice should subscribe for a good mechanical journal and read it carefully. This will keep him informed in the various new ways of doing work, and also of the new machines and tools which are brought out from time to time. The papers should not be destroyed but filed away and kept for future reference.

Second-hand machines are sometimes good and serviceable, but a second-hand boiler is to be looked upon with suspicion, especially after it has lain idle for a considerable time.

The system of educating criminals in prison to compete with free workmen and hiring them out to contractors at fifty cents a day is a blemish on our boasted liberal democratic government. It is an evil which calls for a radical remedy.

The Condensation of Steam.

BY HENRY W. BULKLEY, ENGINEER, 149 BROADWAY, NEW YORK.

When James Watt, many years ago, experimented with the rude Engines, at that time employed to pump out the tin mines of Cornwall, he found that an *enormous loss* of steam was caused by the method of *condensation* then in vogue. A jet of cold water was thrown into the cylinder at the completion of the upward stroke of the piston, which condensed the steam, thereby forming a partial vacuum, so that the piston was then forced down by the atmospheric pressure from above. The cylinder being thus cooled off at every stroke would absorb much heat before being again raised to the temperature of the boiler steam. Watt then conceived the idea of a Condenser *apart from the steam cylinder*, but connected thereto by pipes, and continually exhausted by an *air-pump* worked from the engine. The exhaust steam could then rush out into the condenser, being instantly condensed by the water injected therein, without seriously cooling the cylinder as heretofore. He also added an upper *cylinder cover*, with stuffing box for the piston rod, and he increasd the boiler pressure, so as to drive the piston with greater force.

In this form, with some changes of detail and construction, we find that most of the Marine and stationary engines of to day ; although where water is not abundant, or where the benefits of condensation are not understood, engines are operated on the "*high pressure*," or non-condensing plan, thereby requiring an increased pressure of steam to overcome the atmospheric resistance. If the water is salt, or if highly charged with mineral substances, the condensation is effected by cold surfaces, composed usually of many small tubes, *through* which the condensing water is forced, while the exhaust steam is admitted around them, and is thus deprived of its heat. By this plan, the water in the boiler is maintained *pure* and *fresh*, being alternately evaporated in the boiler, and condensed in the condenser, continually.

To estimate the *loss in fuel and power* by the "high pressure" system referred to, it should be remembered that as the boiler and steam cylinder are *air tight*, the action of the steam on the piston is not complete, if opposed by the pressure of the atmosphere on the exhaust side of the same. To the atmospheric resistance, must be added, the back pressure caused by the friction of exhaust passages, valves, pipes, heaters etc. The atmospheric pressure is about 15 pounds per square inch, while the steam back pressure varies from 1 to 10 pounds, the latter amount being after caused by a valve in the exhaust pipe, or by a defective feed water *heater*. In many "Indicator" tests, made by the writer on engines by the best makers, the average steam "back pressure" is from $1\frac{1}{2}$ to 3 pounds per square inch, besides the atmospheric resistance. The theoretic gain which the condenser will effect, in removing these resistances from the piston, is evidently the ratio which the same bear to the average *total pressure* on the steam piston.

The analysis of a large number of indicator diagrams show, that owing to reductions caused by pipes, governor and stop valves, by expansion and condensation in the cylinder, the average total pressure is *under* 40 *pounds* per square inch on the piston. Of this sum, a "vacuum" equal to 14 pounds per square inch is 35 per cent. and where the "back pressure" is considerable, or if the mean steam pressure in the cylinder is less than before stated (as is common) the percentage of gain by the "vacuum" is from 40 to 45.

When the resistances referred to are removed from the piston, the steam is cut off earlier, and thus expanded further in the cylinder which reduces the draft on the boilers, and allows a slower combustion of the fuel. In these several ways is economy promoted by condensation of the exhaust steam and by the consequent vacuum formed in the cylinder.

The theoretic gains before mentioned, are however somewhat reduced by *condensation* in the cylinder, as it is opened alternately to the cooler condenser and the boiler steam. This condensation varies with the degree of expansion employed, being the *least*, when the steam follows full stroke. Another deduction must also be made for the power absorbed in working the *air pump* which continually removes the water of condensation, the uncondensed vapor, and the air from the condensed. The capacity of the air pump is usually one sixth that of the steam cylinder when worked directly by the main engine, and from 4 to 5 times larger than would be required for removing the water of condensation alone. The vertical pump, having valves in its piston or "bricket," and delivering its contents through a "floating top" or cover, gives the best results, as the air and vapor are thus *lifted* and not *forced* out of the condenser and a more perfect exhaustion is obtained.

The *air-pump* piston, being resisted by the pressure of the atmosphere, requires from 5 to 7 per cent. of the effective power of the engine for its operating on stationary engines of average capacity.

The above variation depends somewhat on the arrangement and proportion of the apparatus, as well as on the condition of its packings, bearings, etc. On large marine engines of improved construction, the power absorbed by the air pump is not over 3 per cent. of the engine power, while on some land engines it is found to be over 10. It is greatest with the *best vacuum*, as there is then little back pressure in the condenser to counterbalance the atmospheric resistance.

The water of condensation, delivered by the *air pump*, usually has a temperature of 100 degrees, as a much higher temperature seriously reduces the vacuum, unless the *air-pump* is unusually large. The *practical gain* by condensation is then from 20 to 30 per cent. (varying with the conditions named), as is demonstrated in the daily working of condensing engines on both sea and land.

By the method of condensation described, no advantage is taken of the velocity with which the exhaust steam leaves the cylinder, as this is instantly destroyed on entering the condenser by the cold water injected therein. It is next proposed to show that this force, if properly directed, will dispense with the air pump and *three fourths* of the power required by the same, besides securing a cheaper, simpler, and more durable apparatus.

Men employed at "starvation wages," can hardly be expected to work with the same energy and cheerfulness as those who are assured, as a reward of their labor, of sufficient means to decently sustain themselves and families. However much they may be wronged, the public at large has no right to step in between employer and employed, except, when through the sordidness or indifference of the former the lives and property of outsiders are placed in jeopardy. Numerous disastrous boiler explosions are caused by the mistakes of incompetent engineers, who were employed because they would work cheaper than those of skill and experience. No man *has a right* to employ an unskilled or incompetent engineer to run a boiler, where an explosion would be likely to destroy human life, no matter how cheaply he may be engaged.

We have examined with much interest a new art publication issued by Prof. D. T. Ames, Broadway, New York. entitled "Compendium of Practical and Ornamental Penmanship." It consists of forty-eight 11x14 plates, comprising more than twenty complete alphabets, with numerous elaborate and artistic designs for engrossed resolutions, memorials, certificates, book marking, title pages, monograms, borders, cards, and miscellaneous designs for drawing and flourishing. Works of this class have heretofore been limited to giving alphabets and a few simple designs for flourishing and lettering : the old methods of engraving and printing precluding the production of large elaborate pages of practical designs for lettering and scrolling, on account of the great expense. Besides the disadvantage of cost, most old works of this class often reflect more the skill of the engraver than of the artist, leaving the pupil in doubt as to the real skill of the author. The new photographic method of reproduction insures a perfect fac simile of the original. The work supplies a want much felt, and will undoubtedly be widely appreciated wherever the English language prevails.

Practical Education.

In our first issue we urged the importance of teaching the Elements of Mechanics in our common schools, in a more practical and thorough manner than is generally adopted where any attempt is made to teach this branch of useful education. Any intelligent observer of the signs of the times can not help but notice the growing demand for a better, more independent, and less theoretical tuition in our higher institutions of learning. The acquisition of dead languages may prove to be of great benefit to the student of a profession ; but for the bright, promising youth, whose life is to be spent in any ordinary active business pursuit, to expend his best energies and most susceptible years in charging his memory with Greek and Latin mythological literature, is a waste of the highest powers and capabilities granted by the Creator. We are gratified to see that at least one State executive is quickened by the spirit of educational reform, and dares the cruel wrath of Jupiter, Juno, and all the other gods and goddesses, great and small, enshrined within the walls of most American colleges. The following is an extract from the last annual message of Governor Hartranft of Pennsylvania. The italics are ours :

"It is impossible to read the industrial history of the country without being struck with the decline of the system of apprenticeship, the decadence of skilled labor, and the rapid increase of common day laborers. Many causes may be assigned for these results. The invention of labor-saving machines, the minute sub-division of labor, and the intense competition among producers and manufacturers, have, no doubt, served to lessen the pride of the workman in his work, and make it impossible, in many instances, to give any time or opportunities to mere learners. To counteract these influences, the assistance of the State will be required. But another cause, arising from the misdirected efforts of the workingmen themselves, can only be removed with their co-operation. Trades unions and various labor organizations, which profess to elevate the condition of the laboring classes, have, in reality, materially contributed to impoverish and degrade them. Millions of dollars have been collected from workingmen and squandered in profitless strikes, during which other millions have been lost through enforced idleness, without even a transient effect upon the natural fluctuations of wages. The independence of individuals has been sacrificed to the tyranny of a class and they have gradually learned to depend for prosperity upon other agencies than their own industry and thrift. The regular education of skilled mechanics has been restricted by the same agencies, forcing the growing generations into the undistinguished mass of day-laborers, the lowest and poorest paid of any class, and reducing the nation to the necessity of supplying its skilled labor from foreign countries. These things strike at the welfare of labor and the prosperity of the State. Even from the workingmen's standpoint, no good that it seems possible to derive from such means can compensate for their deteriorating effects upon the condition and morale of the laboring classes. The growth of the individual is dwarfed, his substance wasted and his children deprived of their rights. The doors of his own trade and all others are closed against them by his fellow-workmen, and they must enter another calling, or become the mere drudges of society. As long as the trades are closed, as at present, we must ever complain of over-crowded professions and commercial pursuits, of a lack of skilled mechanics and common laborers.

"In this question not only the workingmen, but the State also is deeply concerned. 'The great warfare of the nineteenth century is industrial warfare ; the struggle between great nations for supremacy in various industries, and for control of the various markets.' Several foreign nations and a few of the States have foreseen the conflict and begun to educate their people. Pennsylvania has unrivaled resources, but unless she prepares for the competition, she must content herself with the production of raw materials, and her people become the hewers of wood and drawers of water for more highly cultivated communities. The means must be the diffusion of technical knowledge among the laboring classes ; securing the co-operation of the working men ; creating new industries and diversified interests, and throwing the ways to honorable and lucrative employment open to all. The work of the schoolmaster must undo the work of the demagogue, and the State supplant the organizations of labor with industrial schools and workshops. If the workingmen will spend the money now used in keeping up such organizations and lost in strikes, in keeping their children at such institutions and co-operating with the State, the dignity and average value of labor will be rapidly raised. *Heretofore public education has been too much in the interest of a class. The influence of the old scholasticism has been powerful enough to overbear the force of modern industrial and scientific demands. The resultant has learned too much in one direction, and undue prominence has been given to professional and classical education over industrial and scientific training.*

"A thorough system of industrial training must embrace the children, the workingmen, and the people. The children of skillful and prosperous mechanics might find in the primary schools instruction in mechanical and free hand drawing ; and to those who are circumscribed by harder conditions, free night-schools could furnish the opportunities of a slower advancement. Reform industrial schools, under a wise system of compulsory laws, could gather the children of utterly destitute or vicious parents and educate them for a useful calling, without contact, on the one hand, with acknowledged paupers and criminals, or lowering the public schools, on the other hand, with offensive poverty or low associates. In addition to the theory, it may be necessary for the State to afford practical training in the mechanical arts. It is not probable that the old system of apprenticeship, which has gradually fallen into disuse, can ever be generally restored. Two causes alone would seem sufficient to prevent it. In the extensive modern workshops, the proprietor, or master mechanic, or foreman can never find time to devote to the instruction of apprentices, who are constantly left to pick up, in a desultory manner, what little they learn, and in many industries the necessity of producing articles at the least labor and expense, to compete with others in the markets, requires the highest skilled laborers, for which they must depend upon the overstocked labor markets of the old countries, as they cannot afford to educate new hands. Believing that, under these circumstances, no remedy can be found except through the direct agency of the State, I renew my recommendation, contained in the message of 1875, for the establishment of workshops in connection with industrial schools, and beg leave to refer you to the current report of the Superintendent of Public Instruction for the proofs he has collected of the feasibility and advantages of the plan.

"It will, perhaps, be a slow and difficult task to secure the co-operation of the present generation of workingmen. But in all the large cities and towns, where that class are principally congregated, lecture and draughting-rooms could be added to the night-schools and such instruction given as would interest adults. Everything that will tend to recognize the importance and dignity of labor ; that will excite the pride and emulation of the artisan in his work ; convince him of the interest of the State in his welfare and the welfare of his children, and secure the fruits of his industry and thrift, should be done ; and I am convinced that nothing will contribute so much to these results as the establishment of industrial and scientific schools and workshops by the side of our present high-schools and academies. Finally, the appreciation and demand of works of art and skill must keep pace with capacity to create them. Museums and art galleries, and other public collections, are also important factors in industrial education. Accordingly, I took occasion last year to recommend the arrangement, for public exhibition, of the specimens collected by the Geological Survey, and to suggest that you consider the advisability of extending State aid to the Philadelphia Museum and School of Industrial Art. The latter institution has, during the year, opened free schools of drawing and design, and as the State, if it decides to add industrial education to the public school system, will need competent teachers in these branches, this fact gives it additional claims to the recognition of the authorities. I venture to hope that this subject will early engage your labors, and that the public system will receive a symmetrical development corresponding with the conditions of a highly industrial age and the large and varied resources of Pennsylvania."

Rules and Regulations.

We continue from last issue our publication of shop rules. The general regulations coming first in this connection are the result of twenty years' experience in one of the largest New England machine works.

GENERAL REGULATIONS.

"Ten hours labor shall constitute a day's work, viz : from 7 to 12 A. M., and from 1 to 6 P. M."

"All persons employed will be engaged by the hour. No time less than one hour will be taken, and all work, whether by day or piece, to commence and cease at even hours."

"All employees will enter and leave the Works by the East basement door, except during working hours, when entrance and exit may be had at the East door on the first floor."

"The sounding of the Gong will be the signal for closing the doors and the commencement and leaving off of work. No stopping of work or washing up either by day or piece hands can be allowed before the signal is given."

"Hands desiring to be absent will make application to the foreman who supplies them with work, and when unexpectedly detained from work notice must be sent immediately. Absence from work without permission or notice as required above, will be considered as indifference to the Company's interest, and be treated accordingly. Punctuality and regularity upon the part of all employees will be indispensable."

"The pay roll will be made up at the end of every four weeks, and payment made on Saturday of the following week. Employees will be paid off *only* at their places in the shop, between 5 and 6 P. M. Those who are absent will be paid off on the Monday following."

"Hands will not be called to the office except in cases of necessity, nor can they be permitted to take visitors into the works."

"Unnecessary Conversation, Reading, Whistling, Smoking or Frolicking are strictly prohibited in the Works, either in or out of working hours. The working of Hands for themselves is prohibited and stock or material of any kind will not be sold for such use."

"Each person employed will see that his bench and tools, and the machines used by him, are kept clean, and when in need of repairs report the same to his foreman. Special care will be expected from all to avoid injuring Machines, defacing Fixtures, breaking of Glass, Wasting of Files, Oil, Waste, Emery Cloth and other Stock."

"These Regulations are considered a part of the contract with every person in our employ, therefore no one may complain of discharge for non-observance of them."

"All persons in our employ are entitled to the free use of the Library, subject to the Rules of the same."

"When Industry, Energy and Economy characterize an employee he will merit and receive the confidence of the Company, and his interest will be advanced as opportunity presents."

TOOL ROOM REGULATIONS.

"Workmen obtaining reamers, taps, arbors, chucks and other general tools, will please return them promptly, and properly cleaned."

"All tools belonging in the Tool Room, must be returned every Saturday before six o'clock P. M., and if necessary taken out again the following Monday."

"Tools must *not* be passed from one workman to another but returned *individually* to the keeper of the tool room, by the workmen."

"Hands will be held responsible for tools taken by them and not returned as required above."

"Workmen will not enter the Tool Room except by request of the keeper of the same."

"Brushes, Oil Cups, Cold Chisels, Lathe and Planer Tools will be supplied upon the return to the Tool Room of similar worn out tools by the workmen. Files also will be supplied in the same manner."

"When old tools and files are not returned, an order from the foreman will be required before delivering new tools, &c."

"Careless use, or waste and abuse of tools by workmen will be reported to the Superintendent by the keeper of the tool room."

"Civility of deportment between the workmen and the keeper of the tool room will be indispensable."

BLACKSMITH SHOP REGULATIONS.

"Workmen from the machine shop will please avoid waiting for the blacksmith to fix ordinary planing and turning tools, a full supply of these being kept in the tool room for delivery to workmen."

"Hands will wait only for tempering to be done, or such other work as is consistent with an economical use of their time."

"Blacksmiths and helpers will be required to see that steel and iron are cut up economically, always using short pieces when possible instead of cutting from bars."

"Helpers will use their spare time in keeping the Shop and Iron Room clean and in order, and in doing such jobs as will save the time of blacksmiths, such as hammering ends and straightening of stock, &c."

"Civility of intercourse between the blacksmiths and machine shop employees will be considered indispensable."

"It is the duty of the blacksmiths to report to the Superintendent any inattention to the above requirements."

GENERAL REGULATIONS (NO. 2.)

1. "The whistle will blow at 5 minutes before 7 A. M., and 25 minutes after 12 P. M., at which time all the men are expected to be at the works ready for duty. Ten minutes after the whistle blows the doors will be closed, and no employee late will be permitted to go to work, except by losing a quarter of a day."

2. "Ten hours constitute a day's work, being from 7 A. M., to 5:30 P. M., and on Saturdays 9 hours, from 7 A. M., to 4:30 P. M., allowing one-half hour for dinner."

3. "Each employee, on entering the works, will take his respective number of Check from the Time Board, and on quitting work will deposit the Check again with the Time-keeper at office."

4. "Any man losing his Time Check will be charged 25 cents for its replacement. Each man will be careful to take only his own number of Check, as any mistake may result to his loss, as the time will be credited to the number of Check taken."

5. "No employee is allowed to enter or leave the works except through the main office."

6. "Any employee intending to be absent is expected to notify the Foreman of his department at least the day before, or send word if unavoidedly detained, so that his absence may be provided for."

7. "Pay days will be Saturday, and each employee will be paid up in full to the night preceding."

8. "Smoking, unnecessary conversation and waste of time are strictly forbidden during business hours. Any cause of complaint on the part of employees, if duly reported to the Foreman of his department, will be properly adjusted."

"The foregoing Rules and Regulations are established alike for the benefit of employer and employees, and it is hoped that each and every man will act well his part in their proper maintenance, so that the right discipline may be observed."

The Stiles & Parker Press Co., Middletown, are making presses with their patent eccentric adjustment that will stamp raised figures on white metal ware from five to eight times as fast as hydraulic presses. There is also less trouble and expense in its working. We saw a piece of very beautiful work produced on one of their presses with 200 tons force. A year ago they made ties for a steel shuttle (for weaving) and now have an order for another set to be used on the Stiles press.

MANUFACTURES.

NEW YORK.

John Robertson & Co., Brooklyn, are building a hydraulic stone-crusher.

Somers Bros., Brooklyn, will shortly bring out some newly-designed tools for amateurs.

Wm. Burdon, Brooklyn, is about to construct a steam street car. Power is transmitted to the running gear by means of belts.

The Skaneateles Iron Works, which are said to have cost originally $300,000, were recently sold for $5,500.

Wilson & Roake, New York, are preparing to offer upon the market a new style of portable steam engine of their manufacture.

The Freeland Tool Works, New York, have just brought out a new style of double column drill.

The American Steam Car Co., Brooklyn, have nearly completed a peculiar style of steam street car, which is intended to run noiselessly and economically.

A new ratchet-drill will soon be placed upon the market by a New York manufacturer of tools. For particulars see a future issue of the *American Machinist.*

A machine shop has just been fitted up in New York, with new tools for the manufacture of a kind of universal lathe, which we will give particulars about in our next.

G. H. Pond, New York, has patented a novel style of steam boiler. He is having them manufactured, and their efficiency has been tested.

Townsend & Preston, New York, are just placing on the market a power and foot lathe with screw-cutting attachment of their own design and manufacture.

Charles W. Jumper has consolidated his brass foundry with the machine shop of A. E. Litchfield, Auburn. The firm are manufacturing solely the patent water, steam and gas valve recently patented by Mr. Wm. Andrews of Auburn.

MASSACHUSETTS.

Hill, Clark & Co., Boston, are introducing an original style of hollow-spindle turret lathe

A. F. Prentice & Co., Worcester, are about to bring out a new lathe for brass-workers.

W. H. Eddy, Worcester, has invented an original style of short-planer for metal work.

Young and Wheeler, Boston, have lately brought out a new Power Press for cutting sheet metals.

The Lathe & Morse Tool Company, Worcester, are about to place upon the market a new style of upright drill.

The Wiley & Russell Manufacturing Co., Greenfield, are about to place on the market a new drill-press.

The Worcester Wire Company expect to be ready to offer wire upon the market from their own works in a month or six weeks.

A party in Boston has invented a new Drill Chuck, which he will soon commence to manufacture and place upon the market.

N. W. Bancroft & Son have lately started a Machine and Pattern Shop in Worcester. They will make a specialty of Spinning Mules and Jacks.

Wm. Allen & Sons, Worcester, have been introducing, for a few months past, the Victor Feed Water Heater, with very flattering success.

Mr. B. F. Sturtevant is moving his blower manufactory from Boston to Jamaica Plain, five miles out of the city. It will take about a month yet to get the machinery all set up and in running order.

The Taunton Locomotive Co., has received an order for 10 heavy locomotives (24-inch cylinder), from the Union Pacific Railroad. This will give employment to 300 men for five months.

The Wason Manufacturing Company, Springfield, Mass., have received an order from the Panama Railroad Company for 100 freight cars, which, with other work in hand and in prospect, assures a lively winter for them.

Jerome Wheelock, Worcester, is about to bring out a new cylinder oil-cup for steam engines, which is simpler than those now in use, and very prompt and reliable in action. He is building an engine for each of the following parties: Sargent & Co., New Haven; Edward Harrison, New Haven; Underwood Belting Co., Tolland, Conn.; S. Curtis & Sons, Sandy Hook, N. Y., and American Shear Co., Hotchkissville, Conn.

Wm. Allen & Sons, Worcester, are building eight 40 h. p. boilers for one concern; three 90 h. p. steel boilers for the Massachusetts Lunatic Asylum (making a nest of nine of same size, built for same establishment); two 40 h. p. steel boilers for the Washburn and Moen Manufacturing Co.; two 80 h. p. boilers for Bryant & King, Woburn, Mass.; one 40 h. p. boiler for S. Jones & Co., Spencer, Mass., besides a number of small boilers, and an 8-foot flume to go to Millvale. They have just built a boiler for a boat on the St. Lawrence river, which had a Victor feed-water, heater, and purifier attached, also two 4½-foot flumes for the Pequest Mills. The months of November and December, 1877, were the two best they have experienced in business.

RHODE ISLAND.

The Brown & Sharpe Large Universal Milling Machine, is to a machine shop what Webster's Unabridged Dictionary is to a library; the latter is said to be "a library in itself," and the former may well be called "a machine shop in itself." Abridged editions of the milling machine are issued just the same as with the dictionary, suited to those who do not want the most comprehensive work.

Mr. George H. Corliss, the well-known inventor of the Corliss steam engine, will, in a few weeks, bring out at his works, the Corliss Steam Engine Co., Providence, a new engine, embodying the most recent and valuable ideas and improvements. It will be looked for with great interest, especially by all those connected with steam engineering. The original Corliss horizontal engine has been more extensively copied not only in this country but in Europe, than any other engine in the world.

The Brown & Sharpe Manufacturing Company have just brought out a new Automatic Gear-Cutting Machine, the designing and perfecting of which has taken a whole year. It cuts gear-teeth of any size. The feed-head can be raised so as to cut either straight or bevel gears. It is easily adjusted, and does accurate work with the least possible attention. They have also completed a special machine to cut spur gears (beveled or straight), for the Whitehill Sewing Machine Company, New York.

PENNSYLVANIA.

The Phosphor-Bronze Smelting Company, Limited, of Philadelphia, make six different qualities of phosphor-bronze.

The Baldwin Locomotive Works, Philadelphia, are now employing about 1,850 men, divided into relays, one in day time and the other at night, to finish the forty locomotives for Russia. They expect to finish twenty ready for shipment on the 25th of this month.

E. Harrington & Son, Philadelphia, are just introducing a five-spindle drill press. It is completely adjustable; the whole or any one, two, three or four of the drills can be run together while the others are at rest. The drills are operated from a shaft, and can be spread apart or run near together, the distance only being limited by the length of the shaft.

The Philadelphia *North American* has the following: At Messrs. Cramp & Sons' yards their force of men are kept constantly employed. The rolling mills in the northern part of the city are crowded with orders. The principal demand is for small rod and bar iron. The Baldwin Locomotive works anticipate a number of large orders on the return of Mr. Parry, a member of the firm; he is expected in a few days. Messrs. Neafie & Levy have repaired a number of tugs during the past week, and now have the S. Shaw on the marine railway. Two large boilers are being built by the same firm for a Cuban company, to be placed in a coasting steamer. They are in receipt of a number of requests for estimates. Messrs. Baird & Huston's shipbuilding works are crowded to their utmost capacity. They will send an iron specimen of an American tugboat to South America very soon. It is to be 50 feet long, 14 feet beam and 6 feet deep, with a compound high-pressure engine, with 12x12 cylinders. She is being built for Messrs. P. & T. Collins, who have the contract for the construction of the Madeira and Mamore railroad, and is to be used for towing material to the head of navigation on the Madeira river, Brazil. The firm are building it in sections, so it can be erected with ease on arrival at its destination.

CONNECTICUT.

Fanton Bros., Danbury, are manufacturing a new oval lathe.

F. C. & A. E. Rowland, New Haven, propose to manufacture and sell a new steam-pump.

H. B. Beach & Co., Hartford, Conn., manufacturers of marine and stationary boilers and plate work, are closing contracts for a large number of boilers for a New York house.

The U. S. Motor Power Co., New Haven, are building a street car provided with a compressed air engine. It is intended to run 15 miles with one charge of air from the compressor.

L. F. Standish & Co., New Haven, started, last spring, to make machine screws. They have three machines, and are about to add coach or lag screws, and turned machine handles to their manufactures.

The business of Milo Peck, manufacturer of drop-presses, in New Haven, has been carried on since his decease by the administrators. The new firm of Beecher & Peck has just been formed to take the business, and the manufacture of dies will be added to that of presses.

It is said that A. B. Stockwell is to be succeeded by W. K. Garrison of New York in the management of the Howe Sewing machine company, of Bridgeport. The manufacturing operations are to be carried on in the old shop alone, the new shop and the Hotchkiss factory having been vacated.

John Adt, New Haven, is a genius in designing machinery for cutting, straightening and shaping wire to various forms. He has lately designed and built a machine for making pump chain automatically from a wire rod, which greatly cheapens its cost of manufacture. He is also making an automatic machine for turning out steel wire hooks, at the rate of 100 a minute. These hooks are for bale ties, made by Laughland & Co., New York.

The Victor Sewing Machine Co., have sold a number of their Micrometer Calipers for gauging wire and sheet metal. There are so many different styles of wire-gauge in use, that much annoyance and perplexity is caused in buying and selling by them. It seems almost impossible to secure the general adoption of any one gauge as a recognized standard, much as it is desirable. The Micrometer Caliper admits of universal use as it measures with ease and accuracy thousandths of an inch, and any wear resulting from use can be readily taken up.

One well known manufacturing firm in Eastern Connecticut has recently paid its help to the extent of $1,000 in trade dollars, worth only ninety-four cents each; not as we understand it with any purpose of defrauding them—for the brokerage and expressage fees and the limited quantity of trade dollars in the country at present prevents their being gotten at much of any discount just now—but in order to see how the operatives liked this sort of currency. The expressions of disgust which the working men made after handling the cumbrous coin, sixteen dollars of which weigh a pound, were explicit enough to show that they regarded it as a decided nuisance.—*Norwich Bulletin.*

OHIO.

There is some talk of starting a steel shovel factory at the old Lake Shore Woolen Mill, near the L. S. and M. S. R. R. shops in Cleveland.

The Webster, Camp & Lane Machine Company, Akron, are working from thirty to forty hands full time, there being plenty of orders and fine prospects for the coming season.

A new horse nail company has been organized in Cleveland, says the *Trade Review*, with $50,000 capital, to manufacture 1,800 pounds of nails per day. It is called the H. & P. Horse Nail Co.

Stockwell, Bragg & Co. are the sole manufacturers of the celebrated combined (Stockwell's patent) bolt and pipe threading and nut tapping machine; also a machine for tapping gas and steam fittings, taps and dies of all kinds. The special advantage of the threading machine is the great regularity and neatness with which the thread is cut on all kinds of pipes, the machine allowing it to be regulated to any depth required. Address Ravenna, Ohio, Oak Street, between Chestnut and Prospect.

NEW JERSEY.

Stevens, Roberts & Havill, Newark, are to place upon the market a new reaping machine.

An order for ten new engines has been received by the Grant Locomotive Works, Paterson.

Heller & Bros., Newark, have 75 hands at work in their file factory. They are just putting in a Bradley Cushioned Hammer.

The Elizabethport Manufacturing Co., of Elizabethport, have started to manufacture a new patent hoist for shops, warehouses, etc.

Watts, Campbell & Co., Newark, are about to bring out an improved large size boring mill. It will take on a piece of work up to 30 feet in diameter.

Kochenrath & Strosberg, file, saw, and grindstone manufacturers and dealers, Louisville, have received one hundred and sixty-five tons of grindstones, and are quite busy with orders for saws, files, etc., from Clarksville, Tenn., Versailles, Ky., and other interior cities.

Exports.

Jones & Sons, of West Troy, N. Y., have recently shipped ten horse cars to Bombay.

The valve works at Indian Orchard, Mass. have sent 54 valves to Zurich, Switzerland.

The Lewiston, Me., Machine Company are shipping looms to the Dundas Mills, Canada.

Watts, Campbell & Co., Newark, are busy in making sugar mill machinery for Cuba.

The Exeter Machine Works, Boston, find a demand for their Hawkins' blower in foreign countries.

The American Steam Car Co., Brooklyn, has received an order to build a torpedo boat for the German Government.

The Gong Bell Manufacturing Co., Easthampton, is doing a good business, and filling large orders for foreign countries.

The rolling mill of the Philadelphia and Reading Railroad Company, at Reading, is engaged in rolling 45-pound rails for the Maderia and Mamore railroad in Brazil.

James Cook & Co., boys' printing press manufacturers, New Haven, are sending their presses to Australia and other distant countries.

Leonard & Ellis of New York, Boston, and Philapelphia, find a good demand for their "Valvoline" Lubricating Oil in England and other foreign countries.

P. Blaisdell & Co., Worcester, have sold a number of their lathes and upright drills to parties in Canada, England, and Germany. They have a regular agency in the latter country.

Anton Heim, New York, is selling belting of his manufacture direct to every country in Europe, also to Canada, Australia, New Zealand, China, Japan, Manila Islands, South America, and the West India Islands.

The Stiles & Parker Press Co. are making presses to go to England to make watches on the American system; a punching press to go to Germany; also, a drop hammer for St. Petersburgh to make buttons.

Geo. V. Cresson, Philadelphia Shafting Works, has exported shafting to Germany and Central Europe; also to Russia, to Cuba, and South America. He has furnished the Polytechnic School of Russia with new forms of pulleys and couplings.

The Daniels Machine Company, of Wood stock, Vt., have shipped one of their paper stock cutters to Victor Catala of Braine-Le-Comte, Belgium. This machine is to be used in M. Catala's paper mill to cut the stock of fine writing paper, and it is the first of the kind ever shipped to Europe.

Nichols, Pickering & Co., Philadelphia, although manufacturing principally for car builders and railroads, have exported during the year their elliptic and spiral springs to Prince Edward's Island, Canada, Cuba and the British Provinces, to the extent of nearly $10,000.

So far this year there has been an increase in the exports of fanning mills and horse powers, a very large increase in brass and manufactures of, a large increase in coal, an increase in copper ore, glass and glassware, a large increase in pig iron, boiler plate, railroad iron, sheet, band, and hoop-iron and raw material, and an increase in machinery, stoves, etc.; while there has been a decrease in bar iron, steel ingots, bars, sheets and wire, cutlery, mowers and reapers, pig, bar, sheet and old copper, and sewing machines.

Extra endeavors have been made in Germany to overcome the growing demand for American agricultural machinery. One large manufactory at Mannheim, employing 300 workmen, consumed seventeen million pounds of materials in 1874, and had a market all over the Continent. In 1872 it turned out 7105 machines of various kinds; 8228 in 1873, and 10,907 in 1874. The value of the last year's production was 1,656,850 guldens—(gulden, 40.8 cents). With the crude implements in use in that country, scarcely one-third of the labor can be accomplished which can be done with our improved land-working tools. Mayence, owing to the cheapness of transportation, is the centre of the importation of agricultural machinery, and American tools generally, the whole being under the direct supervision of Americans, who send their agents to the most distant parts of the German empire.—*Boston Journal of Commerce.*

We often hear it said that there is too much machinery in the country already, and that the manufacture should be curtailed until demand overtakes production. A great part of the machinery now on the market is only fit for the junk shop by reason of its being superceded by improved styles. It is poor economy to buy a machine because it is cheap if it is out of date.

Steel boilers are taking the place of iron to a greater extent than ever before. Steel plates are but little more expensive than best charcoal iron.

STANDARD PRICE LISTS.

Price List of Lap-Welded Boiler Tubes

OF STANDARD GAUGE, NOT OVER EIGHTEEN FEET LONG.

Outside Diameter	1	1¼	1½	1¾	2	2¼	2½	2¾	3
Wire Gauge	15	15	14	13	13	13	12	12	12
Price, per foot	0 23	0 23	0 23	0 23	0 23	0 25	0 29	0 33	0 35

Outside Diameter	3¼	3½	3¾	4	4½	5	6	7	8
Wire Gauge	11	11	11	10	10	9	8	8	8
Price, per foot	0 40	0 46	0 53	0 58	0 67	0 85	1 20	1 60	2 25

Machinists' Hand Taps.

V and Franklin Institute Shape of Thread.

3 TAPS TO SET—TAPER, PLUG AND BOTTOMING.

Diameter.	Price Each.	Diameter.	Price Each.
1-4	$0 45	15-16	$1 80
5-16	50	1	2 00
3-8	55	1 1-8	2 25
7-16	60	1 1-4	2 60
1-2	70	1 3-8	3 00
9-16	80	1 1-2	3 50
5-8	90	1 5-8	4 20
11-16	1 05	1 3-4	5 00
3-4	1 20	1 7-8	5 80
13-16	1 40	2	6 70
7-8	1 60		

Machine or Nut Taps.

V and Franklin Institute Shape of Thread.

LONG SHANK.

Diameter.	Price Each.	Diameter.	Price Each.
1-4	$0 60	15-16	$2 40
5-16	70	1	2 80
3-8	80	1 1-8	3 20
7-16	90	1 1-4	3 70
1-2	1 00	1 3-8	4 20
9-16	1 15	1 1-2	4 70
5-8	1 30	1 5-8	5 30
11-16	1 45	1 3-4	6 00
3-4	1 60	1 7-8	6 80
13-16	1 80	2	7 70
7-8	2 10		

Taps for Machine Screws.

Wire Gauge, Size.	Price Each.	Price per Doz.
No. 4	35c.	$4 00
6	35c.	4 00
8	35c.	4 00
10	35c.	4 00
12	35c.	4 00
14	38c.	4 40
16	38c.	4 40
18	38c.	4 40
20	45c.	5 30
24	45c.	5 30

Solid Reamers.

Diameter of Reamer.	Price Each.	Diameter of Reamer.	Price Each.
1-4	$1 40	15-16	$3 80
5-16	1 55	1	4 10
3-8	1 70	1 1-16	4 50
7-16	1 85	1-8	4 90
1-2	2 00	1 3-16	5 30
9-16	2 20	1 1-4	5 70
5-8	2 40	1 5-16	6 10
11-16	2 60	1 3-8	6 50
3-4	2 90	1 7-16	7 00
13-16	3 20	1 1-2	7 50
7-8	3 50		

Iron Review.

PIG IRON.—The whole trade is very quiet, there being but a limited demand and no unusual pressure to sell. Many have not fully settled last year's business and are not disposed to make contracts for the future until balances have been struck. The probability of an advance in Coal gives a rather firmer tone to the market, though there is much indifference manifested on the part of buyers. The figures collected by the American Iron and Steel Association show that in 1877 more iron was consumed than in 1876 and that stocks were in some degree reduced. This to many is a surprise and the anticipation is strong for a better trade this year. The number of furnaces in blast does not seem to vary much. We quote No. 1, $18.50 to $19; No. 2, $17.50 to $18; white and mottled, $15.50. We hear of but few late sales. There were sold 300 tons No. 2 (Plain) Sterling at $16.50; 300 tons Sterling Mottled and White at $15.50; 100 tons No. 1 Coleraine $19, and 100 tons No. 2 Coleraine $18. Several small sales of Chickies No. 1 were made at $21 and $21.50 according to extent of the order. Scotch Pig is quiet and lacking in interest.

MANUFACTURED IRON.—Since our last the price from store has advanced one-tenth of a cent per pound and the tone of the market is better though no marked increase of orders is apparent. The base price for refined bar from store is 2.1c. and for common 1.9c.

WROUGHT SCRAP.—A limited business has been doing at $21.50 to $22 from yard for No. 1.

RAILS.—The usual orders for spring and summer delivery have been placed by the trunk lines. The Erie road placed orders for 20,000 to 25,000 tons of steel at a price equivalent to $40 at the works. The mills are most of them full for spring delivery but are open to receive orders for future delivery. We quote steel rails $40 at mill with a little upward tendency. Iron rails are dull as ever there being scarcely any required. Quoted at $34 to $35 at tidewater. Old T rails are in moderate request at $18 to $18.50.

STEEL.—For all grades there is but a light inquiry though an early improvement is expected. Steel has not advanced in sympathy with iron. The Newark Steel Works have just started their new mill and have a monthly capacity of 300 tons, making it the largest cast steel works east of Pittsburgh. They are making some fine grades of tool steel equal to the best English and at a somewhat lower price.

TANK, PLATE AND SHEET IRON.—The market is firmer, and concessions that were made in December could not be obtained now. Store prices are: Tank Iron @ 2¾ to 3; C, No. 1 Iron @ 3; C. H. No. 1 Shell @ 3½; Best Flange @ 4½ to 5; Soft Catch Iron @ 6½; Boiler Rivets @ 4 to 4½; Sheet Iron, No. 10 to 18 @ 3; Boiler Tubes list price less 20% discount.

Iron Wire.

Nos.	0000 to 6	7 to 9	10 & 11	12	
Cents	9	10	11	11½	₩ lb.
Nos.	13 & 14	15 & 16	17	18	
Cents	12½	14	15	16	₩ lb.

BRIGHT MARKET WIRE..57½ ₩ct. dis. from above list.
" CHARCOAL " ..30 " " "

Cast Steel Wire.

Nos.	⅛ in. to 6	7 to 9	10 & 11	12	13	14	
Cents	23	24	25	26	28	30	₩ lb.
Nos.	15	16	17	18	19	20	
Cents	32	33	34	36	38	40	₩ lb.

25 per cent. discount.

Machinery Wire (soft). Machinery Spring Wire (elastic).

Nos.	00000 to 9	10 & 11	12 & 14	
Cents	15	16	17	₩ lb.
Nos.	15 & 16	17	18	
Cents	18	19	20	

10 per cent. off.

RICHARD DUDGEON,

24 Columbia Street.

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Maker and Patentee of

IMPROVED HYDRAULIC JACKS,

Punches, and Roller Tube Expanders.

AND

DIRECT ACTING

Steam Hammers.

Communications by letter will receive prompt attention.

Jacks for Pressing on Car Wheels or Crank Pins made to order.

BURBRIDGE'S TWEER.

The best article for regulating forge fires ever invented.

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BOILER TUBES, ANGLE, TEE AND GIRDER IRON, BOILER AND TANK RIVETS.

Sole Agents for the celebrated "EUREKA," "PENNOCKS," "WAWASSET," "LUKENS," brands of Iron.

All descriptions of Plate, Sheet Gasometer, Girder Iron, &c., furnished to order. We have a large stock of Plates, Sheets, Rivets and Boiler Tubes, &c., constantly on hand.

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AND

ADVOCATE IN PATENT CASES,

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Pattern Letters,

ALL SIZES,
From ⅛ inch up to 6 inches.

The peculiar features of my Letters are uniformity of Bevel, Symmetry and Proportion combined harmoniously.

Will Cast in Iron as fine as Type.

Founders and others can be immediately supplied at wholesale rates by return of mail.

100 different sizes and kinds.

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S. E. ADAMSON,

3 Park Place, NEW YORK.

Office of PARK BROS. & Co.
Black Diamond Steel Works.
PITTSBURGH, Jan. 9th, 1878.

Mr. A. F. UPTON, *Agt.* Jarvis Furnace Co., Boston,

Dear Sir:—The battery of (6) six boilers set with the Jarvis Patent Gas Consuming Furnace, is giving entire satisfaction as to its value in making steam with the cheapest grades of fuel (Bituminous Slack). We cannot say too much in its favor. We consider it the best plan known to us for setting steam boilers, and we shall re-set our other (14) fourteen boilers with the Jarvis, when we can stop long enough to make the change. We therefore do not hesitate in recommending the Jarvis Furnace for setting steam boilers. Respectfully yours,

(*Signed,*) PARK BROS. & CO.

Engines and Boilers,

SPECIAL PRICES On Boilers to Engine Builders.

Stationary and Portable, to 60 H. P., **kept in Stock**; also, Circular Saw Mills and Power Hammers
ERIE CITY IRON WORKS, Erie, Pa.

LIPSEY ADJUSTABLE STEEL WRENCH.

"RELIABLE"

STRONGEST AND BEST
MANF'D AT 91 WASHINGTON ST. N.Y.
By Roper Calor e Engine Company.

Daniel T. Ames.

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½ and $\frac{9}{16}$ " "	$2\frac{1}{10}$

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⅜ to 2 Round and Square,	$2\frac{1}{10}$
$2\frac{1}{8}$ to $2\frac{7}{8}$ " "	$2\frac{3}{10}$
3 to $3\frac{1}{4}$ " "	$2\frac{5}{10}$
$3\frac{3}{8}$ to 4 "	$2\frac{8}{10}$
$4\frac{1}{8}$ to $4\frac{1}{2}$ "	$3\frac{1}{10}$
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$2\frac{2}{10}$	$2\frac{3}{10}$	$2\frac{7}{10}$	$2\frac{9}{10}$	3	$3\frac{2}{10}$	$4\frac{3}{10}$	
⅜ & $\frac{11}{16}$	½ & $\frac{9}{16}$	$\frac{7}{16}$	⅝	$\frac{5}{16}$	¼	$\frac{3}{16}$	

Ovals, Half Ovals and Half Rounds.

$2\frac{7}{10}$	$2\frac{9}{10}$	$3\frac{1}{10}$	$3\frac{6}{10}$	$3\frac{8}{10}$
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$4\frac{9}{10}$	$4\frac{9}{10}$	4 $\frac{4}{10}$	$3\frac{9}{10}$	$3\frac{7}{10}$	$3\frac{5}{10}$
½×16	14	12	10	$\frac{3}{16}$	¼ & $\frac{5}{16}$
$4\frac{8}{10}$	$3\frac{9}{10}$	$3\frac{6}{10}$	$3\frac{4}{10}$	$3\frac{2}{10}$	3
⅝×16	14	12	10	$\frac{3}{16}$	¼ & $\frac{5}{16}$
$3\frac{5}{10}$	$3\frac{3}{10}$	$3\frac{1}{10}$	3	$2\frac{9}{10}$	$2\frac{8}{10}$
¾×16	14	12	10	$\frac{3}{16}$	¼ & $\frac{5}{16}$
$3\frac{3}{10}$	$3\frac{3}{10}$	3	$2\frac{9}{10}$	$2\frac{8}{10}$	$2\frac{7}{10}$
⅞×16	14	12	10	$\frac{3}{16}$	¼ & $\frac{5}{16}$

	c.
Norway Bar Iron,	5
" Shapes,	6
Nail Rods, P. & Co., 6c., or U. B.	$6\frac{1}{2}$
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¼	$1\frac{3}{10}$	⅜ and $\frac{11}{16}$	$\frac{2}{10}$
$\frac{5}{16}$	$1\frac{1}{10}$	$2\frac{1}{8}$ to $2\frac{3}{8}$	$\frac{2}{10}$
⅜	$\frac{3}{10}$	$2\frac{1}{2}$ to 3	$\frac{4}{10}$
$\frac{7}{16}$	$\frac{6}{10}$	$3\frac{1}{4}$ to $3\frac{1}{2}$	$\frac{6}{10}$
½ and $\frac{9}{16}$	$\frac{8}{10}$	$3\frac{3}{4}$ to 4	$\frac{8}{10}$

Extras on Flats.

	$1\frac{3}{10}$	$1\frac{1}{10}$	$\frac{8}{10}$
⅜×⅛ and $\frac{3}{16}$	$1\frac{1}{10}$	¼ and $\frac{5}{16}$	$\frac{3}{10}$ to ½ $\frac{6}{10}$
⅜×¼ and $\frac{3}{16}$	$\frac{8}{10}$	¼ and $\frac{5}{16}$	$\frac{3}{10}$ to ⅝ $\frac{4}{10}$
⅞×⅛ and $\frac{3}{16}$	$\frac{4}{10}$	¼ and $\frac{5}{16}$	$\frac{3}{10}$ to ¾ $\frac{2}{10}$
1×⅛ and $\frac{3}{16}$		¼ and $\frac{5}{16}$	$\frac{3}{10}$ to ⅞

	$\frac{4}{10}$	$\frac{3}{10}$	$\frac{2}{10}$	$\frac{2}{10}$
$1\frac{1}{8}$×⅛ and $\frac{3}{16}$	¼ and $\frac{5}{16}$			⅜ to 1
$1\frac{1}{2}$ to $4\frac{1}{2}$×¼ and $\frac{5}{16}$, " ×$1\frac{1}{8}$ to 2				$\frac{9}{10}$
$4\frac{3}{4}$ to 6×⅜ to 1 $4\frac{3}{4}$ to 6×¼ and $\frac{5}{16}$ " ×$1\frac{1}{8}$ to 2				$\frac{4}{10}$
$6\frac{1}{4}$ to 7×⅜ to 1 $2\frac{1}{4}$ to 3×$2\frac{1}{8}$ to $2\frac{3}{4}$ $6\frac{1}{4}$ to 7×¼ and $\frac{5}{16}$ " ×$1\frac{1}{8}$ to 2 $3\frac{1}{4}$ to 4×$2\frac{1}{8}$ to 3				$\frac{6}{10}$

Ovals.

$\frac{8}{10}$	$\frac{6}{10}$	$\frac{4}{10}$	$\frac{2}{10}$
½ and $\frac{9}{16}$	⅝ and $\frac{11}{16}$	¾	⅞ & up.

Half Ovals and Half Rounds.

$1\frac{3}{10}$	$1\frac{1}{10}$	$\frac{8}{10}$	$\frac{4}{10}$
½ and $\frac{9}{16}$	⅝ and $\frac{11}{16}$	¾	⅞ & up.

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Bessemer Wire Rods,	$3\frac{1}{2}$
American Bessemer Tire Steel,	
" 3-16 up,	5c
" " " " 5-32 up,	$5\frac{1}{4}$
" " " " 1-8 "	$5\frac{1}{2}$
" " " " 3-32 "	$5\frac{3}{4}$
" Spring Steel,	5
" Tool Steel,	13
" Machinery Steel,	7
" Toe Calk Steel,	5
" Plow Steel,	6
" Sleigh Shoe Steel,	4
" Bessemer Steel,	7
" Steel Crowbars,	$6\frac{1}{2}$

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REVIEW.

As might have been anticipated from last month's review of the market here, there was a general advance out of store to the above list price on the 15th inst., and there can be no doubt now that prices of both iron and steel will continue to appreciate.

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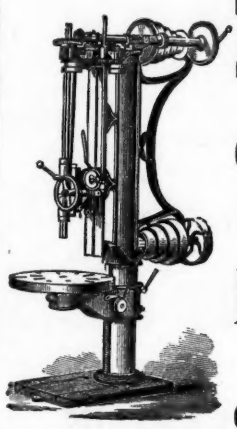

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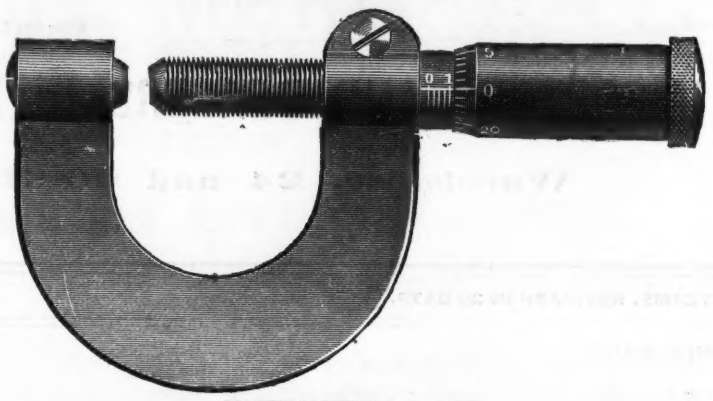

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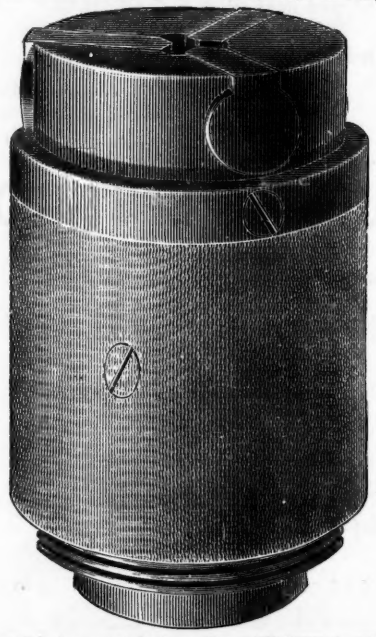

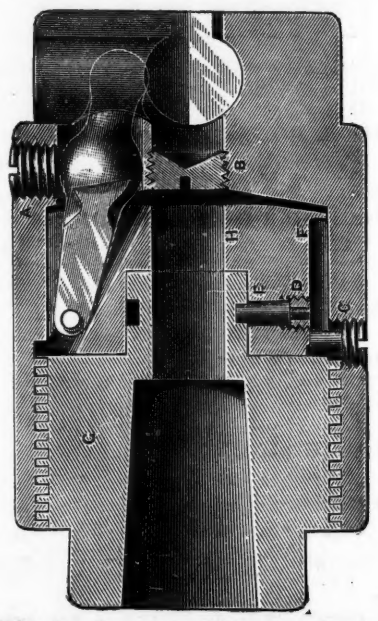

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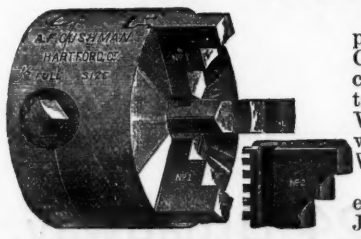

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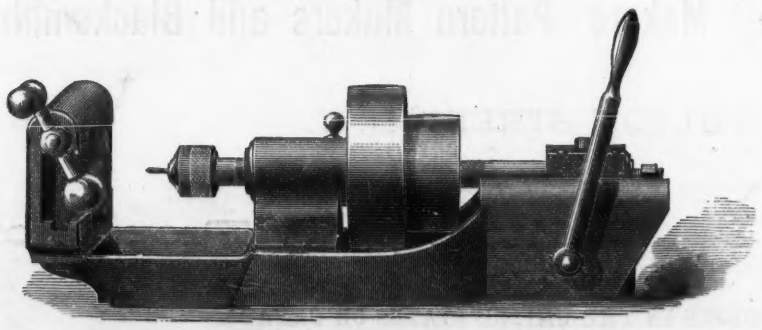

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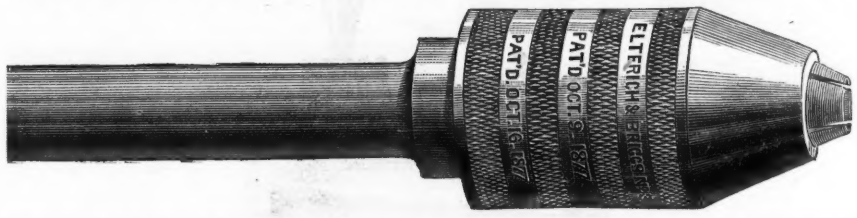

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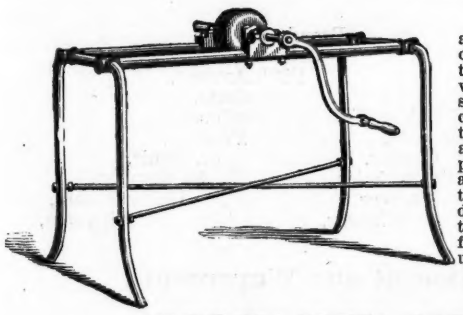

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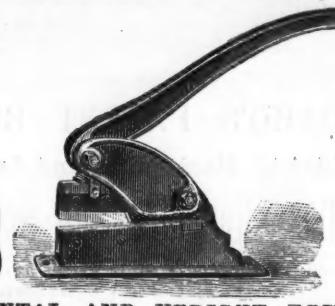

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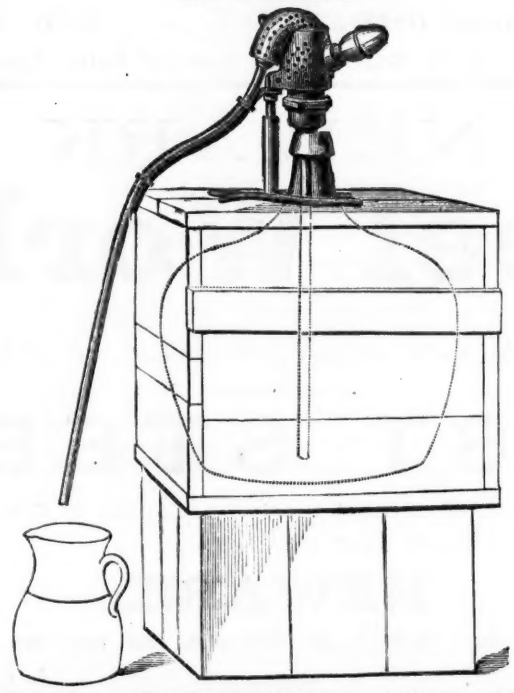

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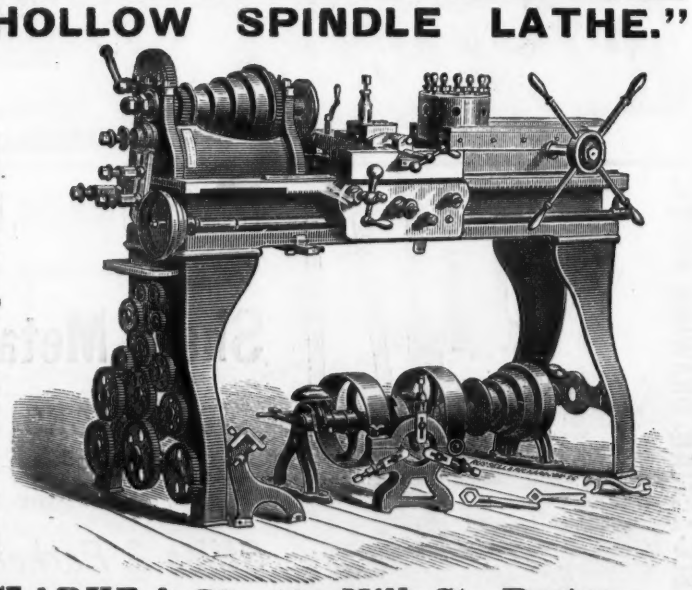

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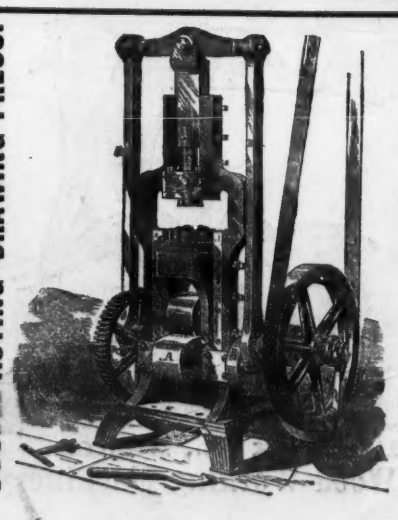

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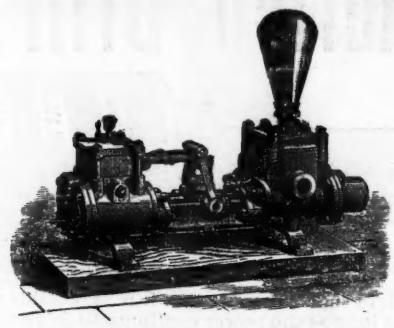

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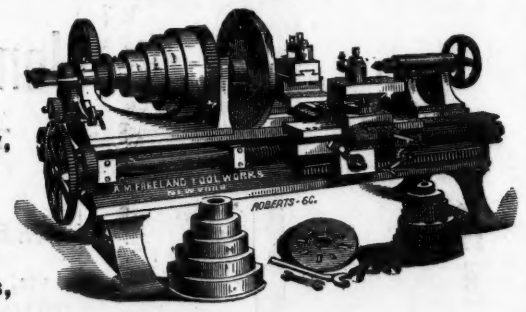

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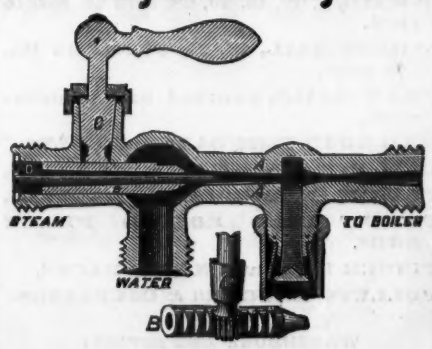

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